The AUTOMOBILE

June 19, 1913

10 cents a copy

You are paying for someone's vulcanizer every time you have a tire repaired.

Your vulcanizer?---

or the *Repairman's?*

Are you getting your money's worth?

One or two per cent of the price you pay for a tire repair covers the cost of material used. Part of the rest goes to pay for the vulcanizer that did the job. What's left just goes from your pocket into the repairman's till.

Why don't you get your own tire repair profits?

You or your chauffeur can do it with a

SHALER Vulcanizer

It's actually easier and quicker to vulcanize a puncture or cut yourself than to try to fix it any other way. Not only is the Shaler Vulcanizer the simplest tire repair outfit, but the Shaler method of tire repairing is something that anyone can master in a few minutes' time. The illustrated book on vulcanizing furnished with each Shaler takes up every detail of the process in plain, clear language. You can't make mistakes if you simply follow the instructions in it.

Tube repairs, — punctures, splices, tears,—are easy. Think of the saving you will make on this item alone. There's no use of paying seventy-five cents every time you pick up a nail. You can make the repair at once at a cost of two or three cents. Your tire is in **your** garage all the time too, and ready to run as soon as the repair is finished.

Let us put you on to something else. You can hardly go a mile without picking up some kind of a tire injury, a cut, chip or tear. It doesn't take long for some of these cuts to gather up mud and dirt and grind them into the fabric, rotting it until a blow-out occurs. Then you're out $50.00 for a new tire.

Now, unless you have a vulcanizer of your own, these cuts will never get any attention. They don't look important enough to turn over to the garage man for repair. With your own vulcanizer, all that's necessary is to prepare the cut, clamp the vulcanizer on the inflated tire (see illustration) and leave it there to work by itself for a few minutes. The automatic heat control takes charge while the vulcanizer is working, saving your time for other work about the car, and preventing all chance of danger to your tires.

But, be sure you have a Shaler Vulcanizer. The automatic heat control, the all important feature in vulcanizing, is exclusive with the Shaler.

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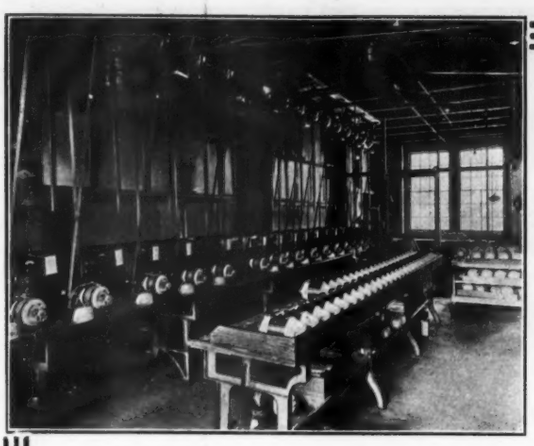

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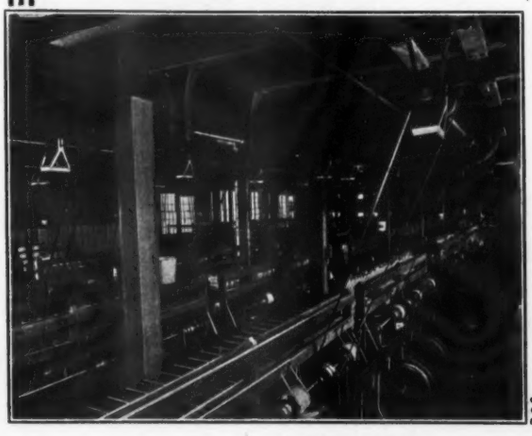

The Automobile

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The AUTOMOBILE

Portable Garage Is a Problem Solver

Private Housing of the Automobile Makes for Economy and Convenience—Garages that Can Be Easily Erected by the Owner

By Sydney Oxberry

WHAT owner making use of the public garage as a storing place for his car has not often allowed his mind to run on the desirability of having his machine transferred to a more convenient place at his own door, where it is ready at a moment's notice, where he is sure no careless outsider is tampering with its mechanism, or joy riding, or appropriating expensive gasoline? A private garage next his own house allows the motorist to proudly display the particular mechanical wonders of his latest speed wagon to every visitor. When a run is suggested there is no long walk to the public garage and no telephoning and the aggravating delay; the car is right at hand. And after a long run with a house party what a much more satisfactory conclusion it is to drive triumphantly up to your own place and deposit your passengers without further trouble.

Nobody would dispute these advantages, but the chary motorist still hesitates to adopt the private garage, sometimes because of the cost, and often because he cannot be sure of the permanence of his residence in one locality, and the expense of erecting a new building for the car at each removal hangs ominously over his mind.

The anxiety is largely without foundation. For the comparatively small outlay of about $200 he can have a firepoof garage with some pretention to good appearance delivered at his home in a few days and erected—by himself if he is at all handy—in a further couple of days, that will house his car and pay for itself in saved storage charges in a few months. The portable garage, as this convenient solution of the housing problem of the automobile is named, is represented by an industry that is already of considerable size, over thirty concerns, furnishing all sizes and types from all-wood, wood and canvas, wood and steel, and all-steel constructions being in active operation. A great variety of styles to suit all tastes are available. The most popular is a plain gable-roofed structure with a floor plan of 12 feet by 18 or 20 feet, provided with an 8-foot door at one end. Many of these are supplied in interchangeable wall sections 2 or 3 feet wide, and are simply bolted together on a framework that is also easily demountable. By these means an erection of any desired length in 2 or 3-foot stages is obtainable. It is the custom of practically all makers to furnish window sections identical in size with the plain side units, so that the number and placing of the windows are at the discretion of the erector.

Fig. 1—View of a typical one-car fireproof portable garage that can be erected without special foundation in a couple of days. Fig. 2—The same en route for new quarters

The size of garage required should receive careful consideration by the prospective purchaser. It is true that a shed 10 feet by 14 feet will accommodate a small runabout, for instance, but to be of really practical use it is advisable to

Fig. 3—Fireproof Rusk garage of gable type with ornamental pressed steel sides and hinged window

Fig. 4—Combined workshop and garage by the Metal Shelter Co. The equipment includes a forge with chimney, as shown

choose always on the roomy side. For one thing it is not at all unlikely that the owner of such a machine may be the possessor of a touring car long before the garage has outlived its usefulness. Secondly, and this is of greater importance, nothing detracts more readily from the philosophic calm with which one approaches a repair job than to be cramped for space. Therefore, see that not less than a 3-foot passage way all around the car is provided for. Wheel repairs, in particular are thereby rendered much easier of execution.

Workbench Is Important Accessory

Another matter affecting the size of the garage chosen is the ever useful workbench that ought always to form part of the equipment of every garage, however small. The many repairs that can be easily accomplished with the aid of a small workbench and vise will surprise the automobilist who has been long accustomed to rely on professional aid at every minor ailment of his car. The handiest location for such a bench is at the end opposite the door where, needless to say, there should be a window for daylight work.

Of the two principal constructional methods, wood and sheet steel, each has its advantages and disadvantages. Wood is of course the cheaper, but it does not lend itself so readily to frequent dismantling, nor is it fireproof, both of which points are the principal recommendations of the all-metal garage, though the latter has a somewhat higher initial cost.

As at present designed neither can claim a superiority in the matter of ease of erection. With the help of a friendly neighbor, a stepladder, square and wrench almost any portable garage can be erected in a couple of days.

It may be as well to point out here that the term portable in connection with garages has a wide meaning. All the steel constructions are portable in the full sense of the term, as well as many of the sectional wood type, that is, they can be put together and taken down an unlimited number of times without any detrimental effect on the parts. But the term is stretched to include those wooden constructions which are supplied in accurately cut pieces of lumber capable of being erected without a permanent foundation. These latter are not really at a very serious disadvantage for the owner who lives any length of time in one place. It is not advisable to take such a garage to pieces for re-erection, though that can be done, and any rate in the case of the smaller models it is an easy matter to lift the entire structure onto a wagon for transportation.

Before deciding on a particular garage the building laws of the locality relative to danger from fire should be carefully looked over, and the size of the available plot with reference to distance from adjacent dwelling houses considered.

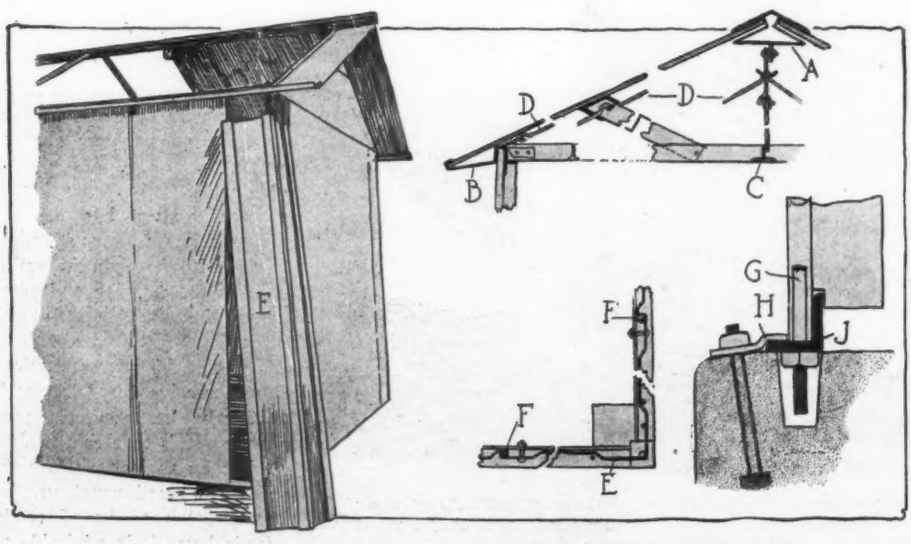

Fig. 5—Fitting of corner and other details of Pruden construction

With regard to the fixing of the garage on the ground, for the smaller types a common and quite satisfactory method is to drive creosoted wood stakes into the ground at the corners and sides, on which the frame uprights or the horizontal sill extending along the lower edge of the walls are bolted. Another favorite foundation suitable for a more or less permanent erection is a set of cement piers with a foundation bolt imbedded in each to which the sill is anchored.

So much diversity of opinion exists as to what is the most desirable method of flooring that the manufacturers of portable garages prefer to leave that detail to the individual taste and requirements of the purchaser. Much, of course,

depends on the nature of the ground, whether it is intended to wash the car inside, drainage facilities available, etc. A cement floor offers perhaps the most advantages, but the trouble and expense of laying one can be avoided by adopting the simple substitution of a couple of wide runboards with a cinder filling. If the soil underneath is at all absorbent this style of floor will be found to allow water to soak easily through the cinders when washing.

Another flooring recommended is a load or two of cinders mixed with cement as a binder. This floor is fireproof, but a means of drainage must be provided or the car always washed out of doors.

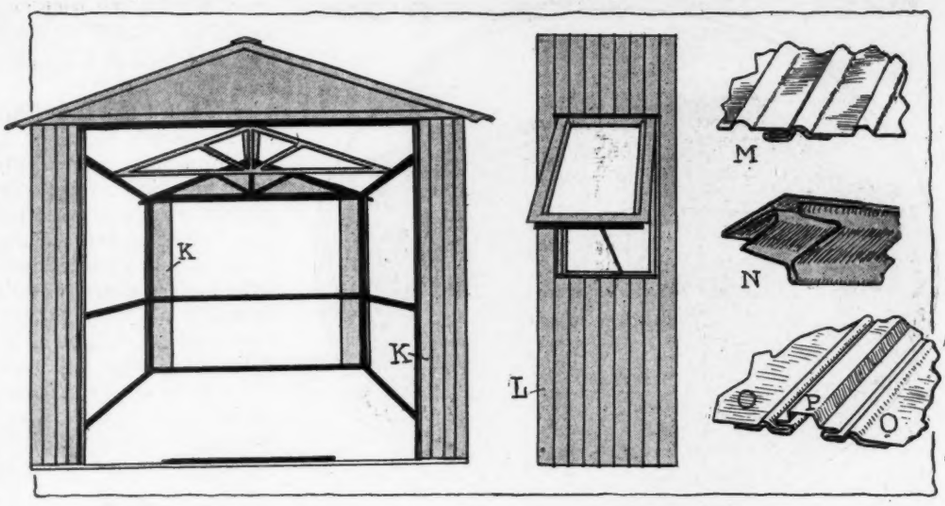

Fig. 6—Framework, side unit and joints in Edwards' portable construction

The constructional features by which the sections of the various portable garages are coupled together to form a watertight joint display much ingenuity. In one metal design the wall units are provided with strengthening webs permanently attached to the inner face, while others receive the required rigidity from the special form of the connecting bar which joins the adjacent sections. A great degree of rigidity is also imparted to the metal sheet either by stamping in ornamental patterns or the more usual corrugations. A popular type of metal siding is that pressed to resemble weatherboards. It is strong and simple and does not offer the same risk of incongruity of appearance with the residence that is the case with the more ornate patterns, though many of the latter regarded alone are pleasing in effect.

In the matter of general appearance a large range of choice exists. The hip roof, an example of which is shown in Fig. 10, always gives a good impression. This style of roof, however, requires a more complicated frame and does not lend itself to the portable feature so well as the ordinary gable roof. The rectangular sides of the gable type of roof facilitate their division into sections in a similar manner to the walls.

The garages shown in Figs. 1 and 4 are two of the many types constructed by The Metal Shelter Co., St. Paul, Minn., which makes structures of any width from 8 feet to 20 feet by any length. The principle of construction is a system of interlocking units in sheet metal, each complete in itself, containing all framework, which when attached to other units completes the structure.

The method of construction is shown in Fig. 5. All the side units measure 2 feet in width by 8 feet high and are made in 24-gauge galvanized steel. Both long sides of each section are formed into tubes or beads in such a way that one section can be rigidly attached to the adjacent section by simply passing a steel rod .375 inch diameter through the junction from top to bottom. At the base these rods pass through and are bolted to a steel angle which forms the sill on which the entire garage rests. This sill is shown in the detail sketch at J, which also illustrates one method of fixing to a cement pier foundation by means of clips H. The vertical connecting bolt is shown at G. After fitting the sides together they are raised to a vertical position and the corner pieces E added. These are bolted to the adjacent side units, the corner itself being supported by one of the vertical rods already referred to.

The windows are 4 feet by 2 feet and are located 4 feet from the ground. They are glazed with .25-inch wire glass or clear glass.

Truss Construction for Roof

Galvanized steel is used for the roof, the sheets resting at their lower edges in special eaves B, Fig. 5. The upper edges meet in a metal ridge A and the whole roof structure is made firm by tightening up the tie rods D. A longitudinal T-iron C extends the entire length of the building to which the cross and oblique members are attached, forming a trussed system.

Prices for the standard one-car garage from $176 for the 10

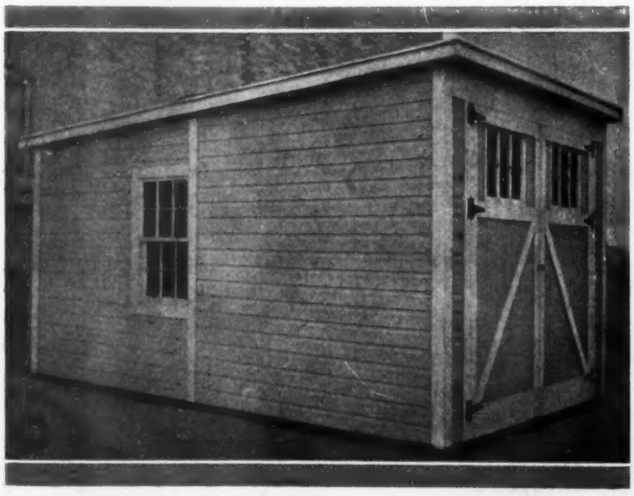

Fig. 7—Pinyoun wood house with single slope roof. Ample light is afforded by glazed doors and side windows

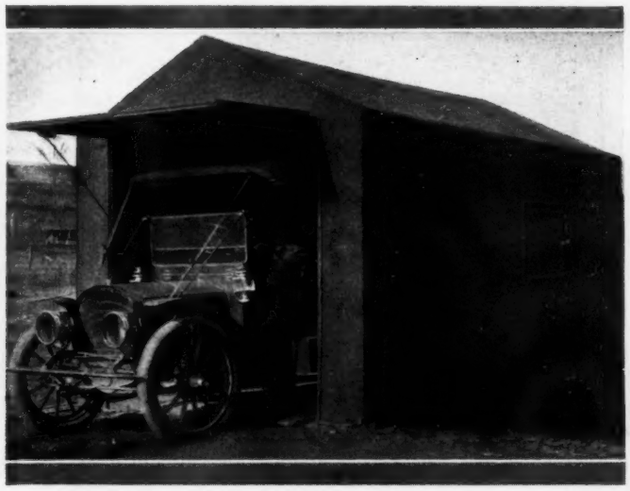

Fig. 8—Kenyon handy portable of waterproof canvas stretched over wood frame that can be erected in a few hours

Fig. 9—Handsome two-car house with hip roof by Springfield Co.

by 12 feet size, upwards, the 12 by 18 feet being listed at $251. Two-car garages by the same concern and on the same principles cost from $322 for the 16 by 16 feet size to $483 for the largest, measuring 24 feet long by 20 feet wide.

A typical one-car "Pruden" garage is shown in Fig. 1. Fig. 4 shows a special construction in which a workshop is combined with the garage proper. This particular model, measuring 18 by 20 feet, is listed at $403. The equipment includes a steel locker for tools, a steel framework for a workbench, and a 5-foot chimney for forge.

The Edwards Mfg. Co., of Cincinnati, O., has evolved a simple system of unit construction fireproof garages that make up into structures with a distinctive appearance. These are made in two types, the "Steelcote," of galvanized steel sheets mounted on a wood frame, and the "All-steel" type, having a framing of angle-iron and being absolutely fireproof.

The framework throughout is angle-iron 1.25 inch by 1.25 inch, and this is supplied ready drilled for the attachment of the side sections. The sills, that is, the lower angles which rest on the floor, are connected at the four corners by angle plates which brace the structure and insure its perfect rectangular form. The method of erection will be clear by reference to Fig. 6 which shows at the left the building partially raised. It will be noticed that additional strength is given to the walls by the use of a central horizontal angle-steel extending around the sides and back at a height corresponding with the lower edge of the windows. Once the frame is erected the corner pieces K are applied and bolted to the corner pillars.

A particularly ingenious method of connecting the sections so as to form what is practically an air-tight joint is used. This is shown in detail in the same illustration. The edges of the adjacent sections O O are held near together and the connecting strip P inserted between them. The piece P extends from sill to roof and its strong channel section will be noted as well as the method of obtaining a sealed joint by means of the vertical flutings in all three parts. In the roof a similar method of fluted water-tight joint M is utilized. At N is shown a section of the roof ridge also made in galvanized steel.

The doors are each 4 feet wide by 8 feet high, formed from 1.25 by 1.25 inch angle steel, braced at the corners and covered with beaded surfacing as used for the side units. The windows, 27 by 36 inches, are swung on hinges at the top, as shown at L in Fig. 6.

For the roof this concern supplies plain sheets or a special pressed steel imitation of Spanish tiling which is attached with concealed nails. Twelve standard sizes are listed, ranging from 10 feet wide by 14 feet long to 14 feet by 20 feet. The prices are from $92.50 to $127.50 for the "Steelcote" type and from $150 to $200 for the all-steel type. The 12 by 20 feet all-steel garage costs $180 and weighs 1900 pounds.

Reduce Number of Parts

Among the makes of all-metal garages in sections, those by the Anchor Corrugating Co., New York, are unique in that the number of parts is reduced to less than half that usually employed. By this means a much simpler construction is obtained, having fewer joints. Contrary to what might be supposed, no part is unwieldy, the heaviest section weighing 50 pounds. A 12 by 18 foot structure by this concern costs $253.

Fig. 3 shows a Rusk fireproof garage with a floor plan of 12 feet by 18 feet. The construction of these buildings is very simple. A rectangular framework of galvanized angle-iron is erected and on this the side walls are bolted. The same concern also manufactures similar structures with wood frames at a lighter cost. The prices range from $101.50 to $235. The example shown in Fig. 3 costs $175 in all-metal and $136.50 in the wood frame type. The makers are The Fargo Cornice Co., Fargo, N. D.

The garage shown in Fig. 7 is a neat wooden building that

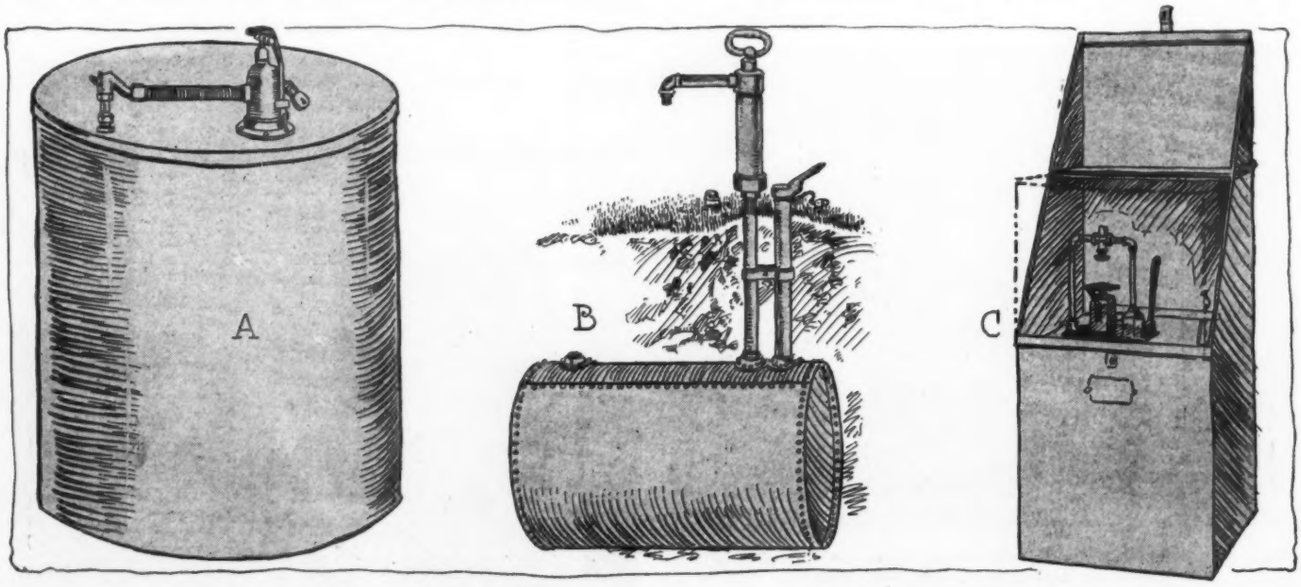

Fig. 10—A, portable gasoline tank with locked pump. B, underground tank for gasoline. C, portable container for oil

can be erected with the help of a wrench and screwdriver. No foundation is necessary, the whole structure being mounted complete on a wood sill at the base. It will be noticed that ample provision for light is made. These garages are made by Pinyoun & Son, Cleveland.

Wood Buildings Look Well

Other wooden buildings of good appearance are shown in Figs. 9 and 11. Fig. 11 is an Aladdin garage by the North American Construction Co., Bay City, Mich. It measures 12 by 20 feet and sells at a net price of $165.30. The other is the product of the Springfield Co., Springfield, Mass. The striking appearance obtained by the hip roof with a slight pagoda dip will be observed. This two-car garage measures 18 by 20 feet and costs $450.

The garage shown in Fig. 8 is an extremely simple affair in canvas and wood. It looks well, can be erected in a few hours, having only slip in joints and thumb screws, and affords ample protection from the weather. It is manufactured by the Kenyoun Co., Waukesha, Wis. The price of a 10 by 16-foot house of this type is $84 without a floor, and the weight only 475 pounds.

A complete list of manufacturers of portable garages follows:

American Portable House Co., Arcade Bldg., Seattle, Wash.
Anchor Corrugating Construction Co., 62 Cortlandt St., N. Y. C.
Berger Mfg. Co., Canton Ohio.
Burnham-Standeford Co., Washington & First Sts., Oakland, Cal.
Chesbro-Whitman Co., 1167 First Ave., New York City.
Craig, David, 70 Broad St., Boston, Mass.
Ducker Co., 277 Broadway, New York City.
Duluth Corrugating & Roofing Co., Duluth, Minn.
Edwards Mfg. Co., 724 Eggleston Ave., Cincinnati, O.
Gordon Mfg. Co., Middletown, Ohio.
O. K. Harry Steel Co., 2333 Papin St., St. Louis, Mo.
E. F. Hodgson Co., 116 Washington St., Boston, Mass.
Ideal Sectional Bldg. Co., St. Johns, Mich.
Illinois Portable House Co., 6331 Evanston Ave., Chicago, Ill.
Karr Portable House Co., 2554 W. Irving Park Blvd., Chicago. Ill.
R. L. Kenyon Co., Waukesha, Wis.
Knapp Portable Permanent Bldg. Co., 111 Broadway, N. Y. C.
Mershon & Morley Co., Saginaw, Mich.
Metal Shelter Co., 3 West Water St., St. Paul, Minn.
New York Portable Bungalow Co., Poughkeepsie, N. Y.
Niles Iron & Steel Roofing Co., Niles, Ohio.
North American Construction Co., Bay City, Mich.
F. C. Pinyoun & Son, 2526 Carnegie Ave., Cleveland, O.
Portable Construction Co., 50 Church St., New York City.
Riverside Mfg. Co., 162 Riverside Ave., Newark, N. J.
J. S. Rogers Co., Moorestown, N. J.
Ruby Mfg. Co., Jackson, Mich.
St. Johns Portable Bldg. Co., 30 Church St., New York City.
Springfield Mfg. Co., 801 Allen St., Springfield, Mass.
Wyckoff Lumber & Mfg. Co., Ithaca, N. Y.

As regards equipment for the garage the safe storage of gasoline is a matter of prime importance.

If the motorist is using a portable garage and does not wish to go to the trouble involved in the sunk tank, a strong cylindrical tank fitted with a pump and strong pipe connection should be obtained and kept out of doors. It should be remembered that

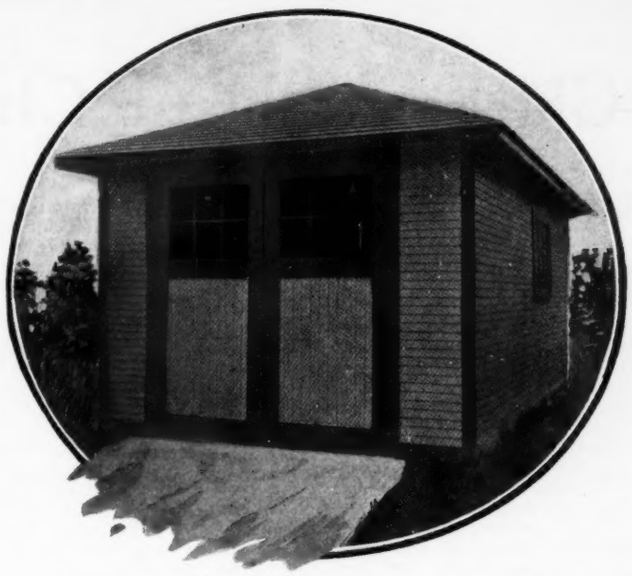

Fig. 11—Neat Aladdin garage in wood with glazed doors

insurance difficulties are much more in evidence when gasoline is kept inside the garage.

A gasoline tank that is suitable for the purpose under consideration is shown at A, Fig. 10. This particular tank is supplied in three sizes, containing 65, 110 and 160 gallons.

An underground tank is shown at B. The pump is screwed into the ground pipe and after using can be removed and a special locked cap put in its place.

A handy container for lubricating oil that is portable and convenient is depicted at C, Fig. 10. All three tanks in this illustration are by S. F. Bowser & Co., Fort Wayne, Ind.

Other types of storage tanks are shown in Fig. 12. The outfit B is supplied by the Cleveland Faucet Co. in two sizes. The 66-gallon tank is listed at $21 and the larger size, taking 120 gallons, at $37.50. These tanks are made of heavy steel with welded seams. The pump A is provided with a foot for mounting inside the garage. At B the pump is shown attached to the tank.

The tank shown at C is intended to be located outside the wall of the garage, as shown. Fitted complete, this outfit costs $28 for the 5-gallon size and $35 for the 120-gallon tank. The maker is The Tokheim Mfg. Co.

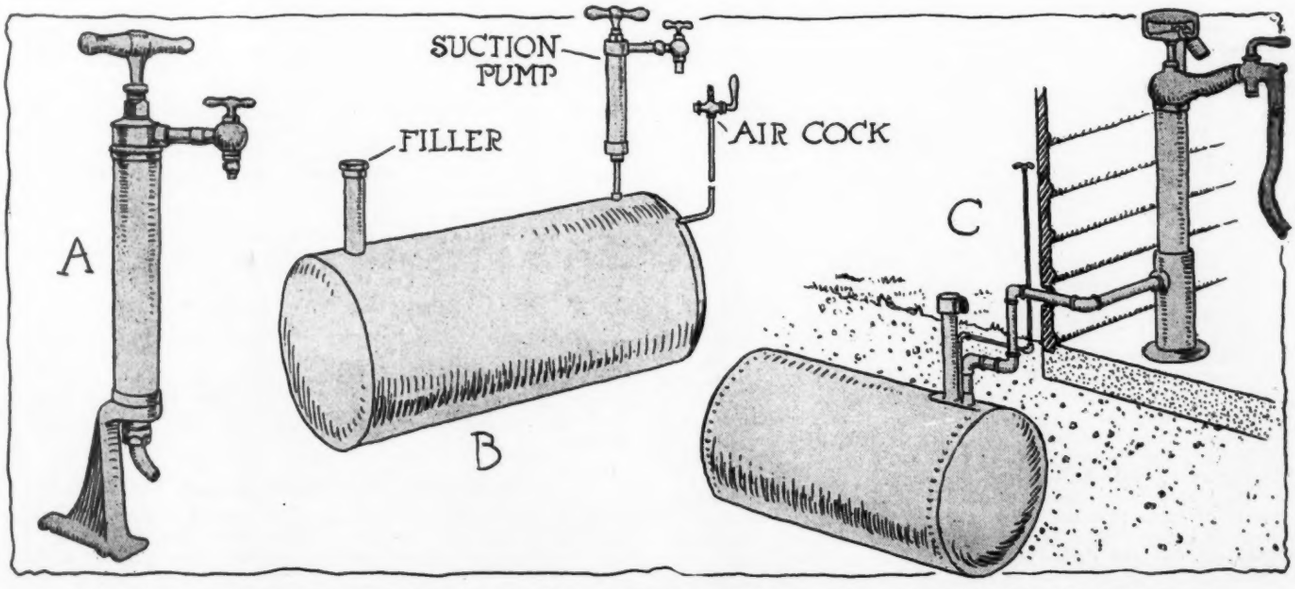

Fig. 12—A, gasoline pump for garage. B, complete underground outfit. C, method of installing tank with inside pump

Chicago Athletic Club Wins Record Run

CHICAGO, ILL., June 16—The sixth annual interclub team reliability match between the Chicago Athletic Association and the Chicago Automobile Club, run Thursday and Friday of last week to Waukesha, Wis., and return, was won by the former, making its record five out of six. The C. A. A. was charged with 57 points penalty, but this was reduced to 22 because of the credit of 5 points for each perfect score. The Chicago Automobile Club was demerited 515 points altogether, but it also had seven perfect scores and in addition was penalized only 9/10 of a point instead of a full point because it had ten contesting cars to the Cherry Circle's nine. This brought the C. A. C.'s final count down to 428.5.

The match brought out the finest example of sportsmanship ever exhibited in these annual matches. The Chicago Automobile Club was unfortunate enough to have on its team a man who totally disregarded the rule which prohibits the participation of women on the tour either as contestants, observers or passengers. Because George G. Greenburg carried two women passengers the first day of the tour the C. A. C. was penalized 250 points through the disqualification of Greenburg. The penalized driver refused to contest the second day unless he could carry the women passengers, so another 250 points were charged against the C. A. C.

Loaded down with this burden, the Automobile Club had little chance to win, but Captain Knisely of the C. A. A. was sportsman enough to offer to scratch two of his cars and take 500 points penalty in order to even up the match. The Automobile Club declined to take advantage of this and continued the contest. At the end of the match when it developed that the Automobile Club would have won if it had not been for the Greenburg incident, the Cherry Circle team pleaded with Referee Beecroft to change his ruling and consider Greenburg as a noncontestant. This that official refused to do, but he did wire the circumstances to Chairman Schimpf of the A. A. A. contest board and telling him of the wishes of the C. A. A. Chairman Schimpf, however, refused to make the change and said that the victory would be credited to the C. A. A., although the two clubs could make any disposition of the trophy they saw fit.

The score in detail:

Chicago Athletic Association

No.	Driver	Car	Score
1	C. T. Knisely	Diamond T	Perfect
3	S. E. Hibben	Packard	Perfect
5	W. F. Grower	Diamond T	3 points
9	C. C. Ireland	Hudson	54 points
11	F. H. Judd	Knox	Perfect
15	W. C. Thorne	Locomobile	Perfect
17	Fred Schaaf	Pierce-Arrow	Perfect
19	F. E. Mann	Locomobile	Perfect
21	L. T. Jacques	Peerless	Perfect

Total penalty	57 points
Total credit	35 points
Final score	22 points minus

Chicago Automobile Club

No.	Driver	Car	Score
2	G. F. Ballou	Apperson	Perfect
4	F. W. Jencks	Moline	Perfect
6	H. W. Sehl	Cole	Perfect
8	P. E. Ennis	Marmon	2 points
10	J. E. Callender	Edwards-Knight	Perfect
12	W. C. Wilson	Moline	Perfect
16	E. C. Patterson	Packard	Perfect
18	G. Greenburg	Packard	500 points
20	J. Dorsey	Alco	13 points
22	F. X. Mudd	Lozier	Perfect

Total penalty	515 points
Total credit	35 points
Final score	428.5 points

Hemery To Race at Elgin

CHICAGO, ILL., June 9—Participation of Victor Hemery, considered one of the best drivers in Europe, in the Chicago Automobile Club's road races at Elgin August 29-30, is assured by the announcement of E. C. Patterson, the Chicago sportsman, that he has completed arrangements for the entry of two poppet-valve Mercedes cars of 450 cubic inches piston displacement, one of which will be driven by Theodore Pilette and the other by Hemery. These two cars will be nominated for the Elgin national trophy race, which will be run the second day.

Elgin this year promises to be the most interesting of the series of races that has been run over the Kane county circuit. Already many entries are in sight. At Indianapolis it was announced that the three Isottas would be entered, with Harry Grant one of the drivers. Ralph de Palma, holder of the trophy, will defend his laurels, while Ralph Mulford is expected to contest in E. J. Schroeder's Mercedes. There is some talk of Goux's Peugeot being nominated, with some American star driving it.

Fairmount Park Race Is Dead

PHILADELPHIA, PA., June 12—The Fairmount Park race is officially dead. Once again had the hope of seeing automobile racing in the Park been revived only to be crushed to earth.

The action of the Fairmount Park Commissioners on Wednesday, when, by a vote of 7 to 2, the petition of the Quaker City Motor Club to conduct the annual 200-mile road race was rejected, conclusively proves that there is little prospect of restoring the classic to the automobile racing calendar under the present city administration. This is the second year the attempt has been made, but little encouragement attending either effort. Of the 16 members comprising the Commission 5 were absent and President Stotesbury and Mayor Blankenburg did not vote.

More Races for Milwaukee?

MILWAUKEE, WIS.—Rumors are being circulated in Milwaukee that the Milwaukee Automobile Dealers' Association is planning definitely to conduct road races on the Wauwatosa course next fall. The association conducted the Grand Prix, Vanderbilt, Pabst and Wisconsin cup races in October last year and lost about $45,000 in the attempt. It is figured that the remainder of this deficit could be made up by conducting another race meet.

PORTLAND, ORE., June 14—The total registration of motor vehicles in the state of Oregon for this year numbers 11,500, as against 8,411 this time last year. During the first 5 months of the year 11,048 motor vehicles were registered and 933 chauffeurs. The total fees amounted to $44,158.

Milwaukee Clubs to Compete

MILWAUKEE, WIS.—The Milwaukee Automobile Club will engage the Milwaukee Athletic Club in an inter-club reliability tour on Saturday, June 28. Each club will be represented by fifteen cars, instead of ten as originally planned, because of the large number of entries made. The route will be from Milwaukee to Lake Geneva, around Geneva lake and return, a distance of about 115 miles. The rules are lenient, and require that contesting cars must be driven by the owner or a male member of his immediate family. Penalties will be imposed for any work done on the car from the time of leaving Milwaukee until being checked in at night, with additional penalities for taking on water, gas or oil outside of control. The pilot work will be done by M. C. Moore in a White, while a 1913 Mitchell 6-60 will act as pacemaker and official car.

Le Mans Race to Be Run August 4

PARIS, FRANCE, June 11—Known as the Grand Prix de France, the 500 miles road race at Le Mans will this year be run on Monday, August 4, under practically the same conditions as the Automobile Club Grand Prix at Amiens. The course is a triangular one, practically dead level, with perfectly straight roads, passing by the racecourse on which the late Wilbur Wright made his first flights in Europe. Entry has already been received of two Peugeot cars now under preparation for the Amiens race. These cars will be driven by Jules Goux and Paul Zuccarelli.

Twenty-Two Now in Coast Run

INDIANAPOLIS, IND., June 17—There are now twenty-two entries for the Indiana-to-the-Pacific tour to be made under the auspices of the Indiana Automobile Manufacturers' Association and which will start from Indianapolis July 1. The association will have its last meeting before the beginning of the tour at the Claypool Hotel.

Wisconsin Tour Dates August 18-22

MILWAUKEE, WIS., June 16—The fourth annual Wisconsin reliability tour under auspices of the Wisconsin State Automobile Association will be held on August 18, 19, 20, 21 and 22, 1913, over a course of approximately 800 miles. The run will be held under grade 1 rules of the A. A. A., it having been

Inter-State License Bill Introduced

WASHINGTON, D. C., June 17—*Special Telegram*—A bill of importance to motorists was introduced in the House today by Chairman Adamson of the Committee on Interstate and Foreign Commerce. The bill provides that a motorist or operator of any self-propelled vehicle using the public highways in interstate commerce shall be required to take out only one license. If the bill becomes a law the license of one state, district or territory must be recognized by all others.

Cannot Save Privilege Tax Measure

JACKSON, MISS., June 16—*Special Telegram*—With the refusal today of the Supreme Court to grant a suggestion of error in the automobile tax case the last chance to save the privilege tax measure has passed. The $30,000 collected by the state will be refunded by a special act of the next legislature. The Supreme Court recently declared unconstitutional the privilege tax which had been imposed on all classes of motor cars.

Vermont Forbids Red Tail-Lights

MONTPELIER, VT., June 14—Vermont has taken the initiative in legislating rear lights showing a red disk off the highways in deference to the requests of locomotive engineers. Within the past few months engineers on some of the trains when rounding curves have suddenly seen a red light loom up at night, and after jamming on the brakes and stopping short discovered it was a motor car on a highway close to the railroad tracks. This happened a few times with the fast Boston and Montreal express, one of the big trains in New England, and so complaints were made to the Highway Commissioners in some of the New England states. The Massachusetts Highway Commission has promied to take the matter up before the next legislative session so that the example set by Vermont will be followed undoubtedly by all the other New England states next year.

The Vermont legislature also changed the law so that the secretary of state now has more power in the suspension and revoking of licenses, and he is provided with investigators to delve into accidents patterned after the Bay State law. This gives the secretary of state power to rule off the highways such persons as he deems unfit to drive motor cars. It provides for hearings when such drivers ask for them.

The legislature also passed a law limiting the weight of motor trucks. It provides that no vehicle including its load shall be moved over the highways or bridges in excess of 5 tons without first obtaining a written permit. No vehicle that has flanges, ribs, clamps or other objects attached to the wheels that will cut into the roads or bridges to any considerable depth may be moved over the roads. Towns may recover for any damage done by such vehicle unless the driver is relieved of the liability. No steam or gasoline traction engine with or without trailers and no motor truck carrying a weight in excess of 4 tons including the vehicle may be operated on highways or bridges at a speed greater than 15 miles an hour; no vehicle, including its load, weighing in excess of 6 tons may go faster than 6 miles an hour, when such vehicle is equipped with iron or steel tires, or faster than 12 miles an hour when equipped with hard rubber or other substance. The fine for violation of this provision is not more than $200.

Tice Roads Bill Passes in Illinois

SPRINGFIELD, ILL., June 6—The Tice good roads bill, for a system of state-aid highways through Illinois, carrying an intermediate appropriation of $700,000 annually for the next 2 years, was passed yesterday by the house by a vote of 111 to 33.

CONCORD, N. H., June 14—The New Hampshire legislature has passed a law for a new state highway that will cut off 25 miles going to or from Bretton Woods by way of Boston.

SAN FRANCISCO, CAL., June 13—The latest automobile record figures from California show that during the month of May, 1913, $7,596,000 was spent for machines in this state, there being 3,798 licenses issued.

The May registrations were the largest in the history of the state, indicating a flourishing condition in the trade. Since May, 1905, the sum of $215,396,000 has been invested in automobiles in California. Motorcycles are not included in this valuation.

BERLIN, June 13—The opening of the celebration of the 25th year of Emperor Wilhelm's reign, his silver jubilee, was marked by a parade of thousands of gaily decorated automobiles which was reviewed by the Kaiser on the suburban military review field. Prince Henry of Prussia, the Kaiser's brother, led the parade, the occupants of the cars cheering their ruler enthusiastically. Joseph C. Grew, secretary, and William Spencer, second secretary, of the American Embassy, drove their cars in the parade.

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deemed advisable to go back to regulations which will insure a strenuous competition rather than a pleasure trip. The first two tours were run under grade 1 rules, but in 1912 it was decided to take a grade 3 run, and while a large entry list was secured, the tour was not as satisfactory from a competitive standpoint as it might have been under the stricter and more stringent grade 1 laws.

M. C. Moore, who has acted as pathfinder and pilot for every Wisconsin reliability run, will start Friday, June 20, on the pathfinding trip in a Mitchell.

A. A. A. Tour Pathfinder Leaves

MINNEAPOLIS, MINN., June 16—The Mitchell pathfinder car for the annual national reliability tour of the American Automobile Association left the Automobile Club in the Hotel Radisson at 2 p. m., June 15. Frank Zirbes was driver.

Algonquin Climb Postponed

CHICAGO, ILL., June 16—The annual Algonquin hill-climb of the Chicago Motor Club, which was scheduled for next Thursday, has been postponed. The reason given is that the hill is not in shape because of a new sewer that has been put in. Lack of entries is another reason for the postponement.

Mulford to Drive Peugeot Racer

NEW YORK CITY, June 16—The Peugeot Import Co., 1620 Broadway, New York City, announces that Ralph Mulford will drive the Peugeot racer, which won the 500-Mile Sweepstakes at Indianapolis, May 30, in practically all the big American speed contests this year. The car has been purchased by a wealthy sportsman who is interested in automobile racing and who has arranged with Mulford to drive it.

Franklin Nearest to Secret Time

SYRACUSE, N. Y., June 16—Edward F. Sparks, driving a Franklin, won the secret time sociability run of the Automobile Club of Syracuse, held Saturday, June 14th. The official time was 2:57:30, and Mr. Sparks was just 12 seconds out of the way, covering the route in just 2:57:18. This gives him possession of the B. E. Watson cup for one year and it is planned to have Mr. Sparks and the three previous winners of the cup hold a contest next year, the winner to have permanent ownership of it. Mr. Sparks also won 5 gallons of Monogram oil by coming in nearest the secret time.

COLUMBUS, O., June 17—Owing to inability to secure sufficient entries and also to the bad condition of bridges, due to the recent floods, the Ohio State Journal Reliability contest, which was to have taken place June 10, will be postponed until July 22.

SACRAMENTO, CAL., June 14—An American Scout was the winning automobile in the Sacramento-Tallac endurance contest, held recently under the auspices of a local newspaper.

Hupp Increases Capital

Raises It from $750,000 to $1,000,000—Makes Sixth Increase in Capital Since Incorporation

Action Taken by Company to Provide for Extension of Factory Equipment and Expansion in Organization

DETROIT, MICH., June 17—Papers have been filed with the Secretary of State at Lansing, increasing the stock of the Hupp Motor Car Co. from $750,000 to $1,000,000. This increase was made by a 25 per cent. stock dividend taken out of the surplus and added to the capital account.

This makes the sixth increase in the capital since the incorporation of the company, viz.: November, 1908, $2,500; December, 1908, $50,000; March, 1910, $25,000; June, 1911, $100,000; September, 1912, $750,000; June, 1913, $1,000,000. The last four stock increases have all been made out of the surplus on hand, in every instance leaving a comfortable margin of surplus in the treasury.

"We took this action," explained the president of the company, J. Walter Drake, "to provide for the extension of our factory equipment and the expansion in our organization made necessary by our preparations for the coming season. A conservative estimate as to the requirements of our dealers for the forthcoming season call for an output of 15,000 cars."

Grossman Company Wins Rajah Suit

NEW YORK CITY, June 16—The United States Court of Appeals for the Second District has affirmed the order in favor of the Emil Grossman Co., New York City, in the suit brought against it some time ago by the Rajah Auto Supply Co., Bloomfield, N. J., for selling repair porcelains for spark-plugs. The order issued by the court in the original suit was in favor of the defendant on account of proving that the defendant did not make it a business to sell such porcelains particularly for the complainant's spark-plug. The Rajah company appealed from this order, with a result that the order was affirmed. The original suit claimed an infringement on the part of the Emil Grossman Co. of the complainant's patent number 825,856. The decision follows:

This is an appeal from an order, which the complainant contends is a final decree, denying a motion to punish the defendant for contempt for an alleged violation of an injunction which enjoins the defendant from infringing the claims of complainant's patent No. 825,856 for improvements in spark-plugs. The defendant is not charged with contributory infringement in making and selling porcelain shells which can be used not only in connection with the complainant's spark-plug, but also in connection with many other spark-plugs dealt in extensively by those engaged in furnishing automobile supplies. The defendant asserts that the District Court was correct in denying the motion for the following reasons:

First. The decree appealed from is not final.

Second. There is no pretense of direct infringement and the selling of the conical porcelains with the intent that they be used in the complainant's spark-plugs is not proven.

Third. The evidence of infringing sales, upon which complainant relies, was obtained by letters induced by it which were answered by a typewriter in the defendant's office without the knowledge or consent of defendant.

Fourth. The matter of which the complainant complains is too trivial to justify the drastic remedy which the complainant invokes.

We do not deem it necessary to enter upon an extended discussion of these questions or to decide them. It is enough that the complainant's case is too doubtful, both on the facts and the law, to warrant the court in punishing the defendant for contempt.

The order appealed from is affirmed.

Asbestos Wins on Motobestos

NEW YORK CITY, June 7—The Asbestos and Rubber Works of America announces that after 2 years of litigation with the American Asbestos Co. over the trade marks "Motobestos" and "Motorbestos," the examiner of the patent office has allowed its claim to "Motobestos" as applied to motor car brake band lining and other asbestos-copper wire fabrics.

Managers for Columbus Buggy

COLUMBUS, O., June 16—Thaddeus C. Dunlap, a civil engineer, and George W. Lattimer, a druggist, have been named by the creditors' committee of the Columbus Buggy Co. to have charge of the management of the plant. The creditors' committee recently took over the plant from the receiver, who was discharged. According to the two managers, every effort will be made to save the big manufacturing plant for Columbus. It is the intention of the managers to continue the manufacture of both gasoline and electric cars for the present at least.

Receiver for Hartford Foundry

HARTFORD, CONN., June 16—The Hartford Foundry Co. is in receiver's hands, Edward C. Frisbie having been appointed temporary receiver. The company's trouble is said to have resulted from insufficient capital. The appointment was made on application of the Charter Oak National Bank, which holds notes for $27,000.

Cutting in Receiver's Hands

JACKSON, MICH., June 17—The Cutting Motor Car Co. of this city went into the hands of the receivers on June 2. The Security Trust Co. of Detroit, Mich., has been appointed receiver and the work of reorganization is now under way. It is stated that the receivership is a friendly one and that the reorganization should be in a position to resume business in the course of a few weeks.

Stuart Motor Corp. Retires Bonds

BUFFALO, N. Y., June 14—At a recent special meeting of the stockholders of the Stewart Motor Corporation, makers of delivery trucks, the company decided to redeem the $50,000 outstanding bond issue immediately. The stockholders also voted to convert $75,000 of the $250,000 common stock into 7 per cent cumulative preferred. $50,000 of the preferred stock has already been issued and paid for at par. This clears the corporation of all bonded indebtedness.

Large White Truck Sale

CLEVELAND, O., June 14—A very large motor truck sale was announced recently by the White Co., Cleveland, O., when the firm of Kaufman Bros., a prominent department store of Pittsburgh, Pa., purchased twenty-three White trucks of 1.5 tons and 1,500 pounds capacity.

Automobile Securities Quotations

NO decided recovery from the decline noted last week was apparent during the past 6 days. Rubber stocks still showed a slight falling off although this tendency was not so sharp as the week before, the bigest decline being that of Firestone common which dropped 8 points, making 37 points in 2 weeks.

	1912		1913	
	Bid	Asked	Bid	Asked
Ajax-Grieb Rubber Co., com	110	115	150	..
Ajax-Grieb Rubber Co., pfd	90	100	95	100
Aluminum Castings, pfd	100	..	97	100
American Locomotive Co., com	41½	41¾	28¼	30
American Locomotive Co., pfd	107	108¼	90	102
Chalmers Motor Company, com	..	..	128	135
Chalmers Motor Company, pfd	..	..	98	102
Consolidated Rubber Tire Co., com	15	17	12	18
Consolidated Rubber Tire Co., pfd	55	60	60	75
Firestone Tire & Rubber Co., com	279	281	228	232
Firestone Tire & Rubber Co., pfd	106	108	104	106
Fisk Rubber Company, com	..	..	..	..
Fisk Rubber Company, pfd	..	..	..	100
Garford Company, preferred	99	101	85	95
General Motors Company, com	33	35	26	30
General Motors Company, pfd	75	75½	72	75
B. F. Goodrich Company, com	79½	80½	26½	28½
B. F. Goodrich Company, pfd	108¼	108¾	90	94
Goodyear Tire & Rubber Co., com	..	276	285	295
Goodyear Tire & Rubber Co., pfd	100	102	98	99½
Hayes Manufacturing Company	..	104	..	90
International Motor Co., com	26	29	4	6
International Motor Co., pfd	89	92	10	15
Lozier Motor Company, com	..	..	15	20
Lozier Motor Company, pfd	..	..	..	92
Maxwell Motor Co., com	..	..	3	4
Maxwell Motor Co., 1st pfd	..	..	30	33
Maxwell Motor Co., 2nd pfd	..	..	9	12
Miller Rubber Company	155	160	..	140
Packard Motor Company	104½	106	94	100
Peerless Motor Company, com	..	..	45	50
Peerless Motor Company, pfd	..	..	..	96
Pope Manufacturing Company, com	30	32	10	13
Pope Manufacturing Company, pfd	74	76	40	43
Portage Rubber Co., com	..	..	..	40
Portage Rubber Co., pfd	..	..	..	90
Reo Motor Truck Company	9	10	..	11⅛
Reo Motor Car Company	24	24½	..	20¼
Rubber Goods Mfg. Co., pfd	..	..	100	110
Studebaker Company, com	36	38	22	24⅛
Studebaker Company, pfd	94	96	82	85
Swinehart Tire Company	104	106	84	86
U. S. Rubber Co., com	..	..	56⅜	58
U. S. Rubber Co., 1st pfd	..	..	100	102
White Company, preferred	107½	108½	102	104
Willys-Overland Co., com	..	..	53	60
Willys-Overland Co., pfd	..	..	80	90

English Engineers Disperse

Some Return to England while Others Remain To Make Closer Survey of Plants and Methods

One To Go on Indiana-to-Coast Tour and Another Accepts Position with Continental Motor

NEW YORK CITY, June 17—The small part of the members of the British Institution of Automobile Engineers which completed the itinerary as laid down in the official program, arrived here last Saturday. The party began to break up when the boat landed at Detroit after the lake session of the I. A. E. and S. A. E. At this point Messrs. Bennett, Buist and Ker dropped out. The next breaking-up point was at Detroit, where the party separated into three, one-third making the New England trip, a third going to New York and the rest scattering. Those making the New England trip were T. F. Benson, L. A. Bollack, J. B. Dunlop, C. A. Branston, J. B. Ferguson, E. Wooler, R. W. Smith senior and junior, E. C. Paskell, and Mr. and Mrs. E. B. Wood. The Messrs. Smith and Paskell dropped out of the New England party to make the trip to Springfield to see the works of the Hendee Mfg. Co., where Indian motorcycles are made.

One convert has been gained to the ways of America. Mr. E. Wooler has accepted a position in the drafting rooms of the Continental Motor Mfg. Co. and has gone back to Detroit. C. A. Branston is making the Indiana-to-the-Coast tour which starts July 1. T. C. Pullinger has returned to Detroit to make a further study of the plants in that city. J. B. Ferguson, Gilbert Moore, J. B. Dunlop, R. W. Smith and son, Charles Wheeler, B. Wood and wife sailed Saturday for home.

The New England trip embraced the following program:

Arrive Providence via Boston 10:15 a. m., June 11. Breakfast in Boston. The day will be spent in inspecting the works of Brown & Sharpe.

6.35 p. m.—Leave Providence, arriving in Bridgeport at 9.39 p. m. Dinner either in Providence or on the train.

Stratfield Hotel at Bridgeport.

Thursday, June 12

In Bridgeport

Visits to plants of Locomobile Company of America and Spring Perch Company.

Locomobile Company of America host at luncheon.

Motor car drive to New Haven, arriving at 2.30 p. m.

Visit to works of New Haven Carriage Company.

Night at Hotel Taft, New Haven.

Friday, June 13

9 a. m.—Leave New Haven by motor car for Hartford.

Visit to plants of Pratt & Whitney, Pope Manufacturing Company and Hartford Rubber Works.

4 p. m.—Leave by boat for New York.

Indiana S. A. E. Elects Officers

INDIANAPOLIS, IND., June 16—At a meeting of the Indiana branch of the Society of Automobile Engineers held at the Claypool Hotel, Indianapolis, on the evening of June 10, officers were elected as follows: Chairman, R. C. Coombs, Prest-O-Lite Company; secretary, C. P. Grimes, Wheeler & Schebler, and treasurer, John Wood, of the Remy Electric Co., Anderson. George A. Weidley, of the Premier Motor Manufacturing Co., the retiring chairman, was elected vice-chairman.

Calder Heads International Motors

NEW YORK CITY, June 17—An election which has just been announced by the International Motors Co. makes a change in the higher officers of the company. John Calder, former first vice-president, has been elected to the presidency of the concern, and R. E. Fulton becomes the first vice-president. Mr. Fulton was formerly the general sales manager.

Schacht Truck Company Incorporated

CINCINNATI, OHIO, June 16—The G. A. Schacht Motor Car Co. has been incorporated with $25,000 capital by Gustave A. Schacht and Charles Talbott. The company will manufacture motor trucks only. Temporary headquarters have been secured out on Spring Grove avenue, near the Schacht Motor Car Co., of which Gustave Schacht was the former president.

To Raise All Insurance Rates

HARTFORD, CONN., June 16—Insurance premiums for all classes of automobile risks are going to cost more in the very near future. Hartford companies as well as others throughout the country are prepared to raise the price. The contention is that automobile accident insurance is now sold too cheaply and the beneficiary gets too much for what he pays. The rise in price will affect 1914 business.

Walk-Out in Studebaker Plant

DETROIT, MICH., June 17.—More than 3,000 men employed by the Studebaker Corporation, in its local automobile plants struck today. The men said the walkout was the result of repeated demands for weekly pay, instead of bi-monthly. The strikers claim that the employees in the other automobile factories in Detroit will act in sympathy with them. The company states that the strikers merely seized upon its refusal to re-instate a discharged employee as a pretext, several I. W. W. men having been trying to incite a strike in the automobile plants for some time.

Goodyear to Establish Tire Stations

NEW YORK CITY, June 16—C. W. Martin, manager of the motor truck tire department of the Goodyear Tire & Rubber Co.'s New York City branch, states, regarding the company's recent announcement of a chain of motor truck tire service stations to be established throughout the large cities of the country, that the time taken up by tire changes has been found such a handicap by truck owners, whose loss on the investment in an idle truck was heavy, that the Goodyear company adopted the day-and-night service station as the remedy.

Market Changes of the Week

Another break in tin occurred again this week, followed by extreme dullness and caution in the local market. There was scarcely enough trading in the open market to establish prices. Tin was selling at $45.30 per hundred pounds on Wednesday and stearily rose therefrom to $45.85 on Saturday. From then on to Tuesday there was a gradual decrease, closing at $44.66, a loss of $.64. A further sharp decline is expected. Lead was stronger in tone, rising .$05 per hundred pounds. Both Lake and electrolytic coppers declined, the former $.00 1-8 and the latter $.00 1-5. Antimony, beams and channels, Bessemer steel, and open-hearth steel remained constant. Both silks from Italy and Japan rose, the former $.10 and the latter, $.02 1-2. Tire scrap remained steady at $.10 per pound.

Material	Wed.	Thurs.	Fri.	Sat.	Mon.	Tues.	Week's Change
Antimony, lb.....	.07½	.07½	.07½	.07½	.07½	.07½	.....
Beams & Channels, 100 lbs...	1.61	1.61	1.61	1.61	1.61	1.61	.....
Bessemer Steel, ton	26.50	26.50	26.50	26.50	26.50	26.50	.....
Copper, Elec., lb.	.15	.14⅞	.15	.15	.14⅞	.14⅝	— .00⅛
Copper, Lake, lb..	.15⅛	.15⅛	.15⅛	.15⅛	.15⅛	.15	— .00⅛
Cottonseed Oil, lb.	7.22	7.30	7.35	7.40	7.40	7.57	+ .25
Cyanide Potash, lb.....	.19	.19	.19	.19	.19	.19	.....
Fish Oil, Menhaden, Brown..	.33	.33	.33	.33	.33	.33	.....
Gasoline, Auto, 200 gals.....	.22¼	.22¼	.22¼	.22¼	.22¼	.22¼	.....
Lard Oil, prime...	.95	.95	.95	.95	.95	.95	.....
Lead, 100 lbs....	4.30	4.30	4.30	4.30	4.30	4.35	+ .05
Linseed Oil.....	.47	.47	.47	.47	.47	.47	.....
Open-Hearth Steel, ton.....	26.50	26.50	26.50	26.50	26.50	26.50	.....
Petroleum, bbl., Kansas crude...	.88	.88	.88	.88	.88	.88	.....
Petroleum, bbl., Pa., crude.....	2.50	2.50	2.50	2.50	2.50	2.50	.....
Rapeseed Oil, refined	.68	.68	.68	.68	.68	.68	.....
Silk, raw Italy....	....	4.50	....	....	4.50	4.60	+ .10
Silk, raw Japan...	....	3.77½	....	....	3.80	3.80	+ .02½
Sulphuric Acid, 60 Baume.....	.90	.90	.90	.90	.90	.90	.....
Tin, 100 lb.....	45.30	45.75	45.85	45.85	45.45	44.66	— .64
Tire, Scrap.....	.10	.10	.10	.10	.10	.10	.....

Haynes for 1914 Is Out

Line Consists of Four and Six-Cylinder Models, All of Which Are To Be Fitted With Vulcan Electric Gearshift

KOKOMO, IND., June 17—The Haynes Automobile Co., of this city has today announced that it will equip its entire line, consisting of four and six-cylinder models, for 1914, with the Vulcan electric gearshifter, which device the company has tested out on its six-cylinder cars for several months to its utmost satisfaction. This announcement of America's pioneer maker fitting a gear shifter device as stock lends much force to the arguments advanced favorable to some form of gearshift other than the lever. Although the Haynes company has made this equipment stock it will fit the lever shift system if requested, and in which case the gearshifter quadrant will be under the car floor and the lever in the center of the floor board for right-hand operation.

In experiments extending over months the electric gear shifter has given entire satisfaction, the engineering force claiming successive hundreds of operations without a miss. In recent tests it has made over 500 changes in a single day without any difficulty being experienced.

The control of the gearshifter is on a circle above the steering wheel. On this circle are seven buttons for use as follows: Three for forward speeds, one for reverse, one for neutral, one for the electric starter and one for the electric horn. *A* button takes the place of the gearshift lever.

The Haynes company has had the question of electric gear shift under consideration for some time and was the second motor car concern to sign contracts with the Vulcan people for its equipment. The operation of this gear-shifting arrangement was illustrated and described in THE AUTOMOBILE for April 3, page 778. In this device solenoid coils are employed as the system of control. There is one of these coils for each speed. Two speeds cannot be engaged at once because each speed is governed independently of the others and an interlocking device provides that no two buttons in the control can be down at the same time. Should the second speed button be set and the driver decide that he wants to go into third, he merely presses the third-speed button which returns the second speed one to its normal position. Pressing the neutral button leaves all of the others normal. Specific details concerning the exact method of application will be published later.

The Haynes company will market two 1914 models, a four and a six, both alike in general details of design and using the same cylinder sizes, 4.5 inches bore and 5.5 inches stroke. The cylinders are cast in pairs and have the valves on one side only as introduced on the 1913 six. Ignition is by Simms magneto with one set of plugs. Pressure gasoline feed is introduced, the gasoline tanks being supported on the chassis in the rear Pressure is maintained by an automatic air pump driven from the camshaft and there is also a hand pump on the dash. Lubrication is by a circulating splash system.

In the motors bearing surface for the crankshaft has been given good attention. On the four-cylinder car, three bearings are used, giving a total bearing length of 11.5 inches. The crankshaft is 2 inches in diameter and the 11.5 inches length is distributed 3.75 in front, 2.5 for the center, and 5.5 at the flywheel. On the six-cylinder model four bearings are used, giving a total bearing length of 14 inches, the dimensions being practically the same as in the four, excepting that an additional center bearing is used.

The chassis details incorporate the standard Haynes contracting type clutch. In the four-cylinder car the McCue axle is used in front and rear, on the six-cylinder, Timkens. An entire new line of bodies has been added, these being die-formed types in which a cowl is used. The cowl curves down and meets the hood which is in reality a continuation of it. A clean-cut appearance is obtained by not using side-dash lamp brackets, rather the dash lights are carried on unions which attach to castings within the cowl. The clean-cut appearance is further accentuated in that there is no visible support for the wind shield on the cowl, but it is, nevertheless, secured to a casting within the cowl. The cowl on all models is alike and is a one-piece, die-formed part.

On the four-cylinder cars open bodies are made with two, four and five-passenger capacity. On the six-cylinder chassis open bodies are made for two, four, five, six and seven-passenger capacity. The six-cylinder chassis is made with two wheelbases, one 130 inches and the other 136 inches. The limousine body is fitted to the latter. On both fours and sixes a line of four-passenger coupé bodies is supplied, these being from the factory of Biddle & Smart.

Externally, all bodies are given a cleaner appearance in that the running boards are entirely free from incumbrances. The battery used for lighting, starting and gear shifting is located under the chassis. It is claimed to have adequate capacity for 1,200 starts and approximately 4,000 to 5,000 gearshifts, the current consumed in gearshifting being very slight. A full electric lamp equipment is used.

Hudson Vice-President Invades Europe

PARIS, FRANCE, June 13—F. O. Bezner, vice-president of the Hudson Motor Car Co., has taken up his residence in this city with the object of directing a business campaign for Hudson interests throughout the Continent of Europe.

Packard Adds Two Truck Models

DETROIT, MICH., June 17—The Packard Motor Car Co. has added two more models to its line of motor trucks, these being of 4 and 6 tons capacity. Heretofore models 2, 3 and 5 tons capacity have represented the company in the commercial car field, and the newcomers will thus broaden the range. The specifications of these two new Packards are along the same lines as the others and show no deviations from the company's truck practice. The motors develop 32.4 and 40 horsepower, respectively, according to the S. A. E. rating. They are T-heads and transfer their power conventionally to jackshafts, the final drive being through side chains.

The wheelbases are 144 inches for the 4-ton and 168 inches for the 6-ton, while a wide range of optional bodies is offered. The prices are set at $3,550 for the lighter of the two and $4,650 for the 6-ton, while in either case an extra long chassis is furnished at $100 extra.

Sanatogen Decision Stirs Manufacturers

NEW YORK CITY, June 14—Manufacturers affected by the Sanatogen decision of the United States Supreme Court have combined in a league to protect the prices of patented articles. No definite action has been taken as yet except the establishment of a permanent organization with Henry B. Joy, of the Packard company at the head of the executive committee. Other automobile men on the committee are A. Erlanger and A. Lucking, both of the Ford company. The remainder of the committee consists of T. F. Murphy, of Mark Cross; E. T. Welch, of Welch Grape Juice Co.; W. K. Kellogg, Kellogg Toasted Cornflakes Co.

New 1,500-Pound Republic Truck

DETROIT, MICH., June 17—The Alma Motor Truck Co., recently organized to take over and continue the truck manufacturing business of the Alma Mfg. Co., of Alma, Mich., recently placed on the market its new 1,500-pound model Republic truck. This company is listing the complete truck with the choice of two standard bodies at $1,425.

DETROIT, MICH., June 17—H. L. Adams has taken over the general managership of the Detroit plant of the Edward G. Budd Mfg. Co., Philadelphia, maker of steel bodies. T. H. Millington has managed this plant up to this time.

Many Americans to Show at Salon

PARIS, FRANCE, June 11.—Paris this year opening the European show season with its salon on Friday, October 17, there will doubtless be a stronger international representation than on previous occasions. Although official applications for space will not be received until next week, there have been several inquiries from American firms and the probabilities are that there will be a big showing of cars from across the Atlantic. The Packard Motor Car Co., which, although having a store in Paris for a number of years, has never been able to secure a position in the show, will put in an application for a central space. The Hudson Motor Car Co. intends to take a big stand. Others to be represented are Ford, Buick, Cadillac and R. C. H. The new Briscoe car, now being produced by Mr. Benjamin Briscoe and a special staff of American and European engineers, will make its first bow to the public at the Paris salon.

The White Co. branch and district managers meet in annual session. Top row, left to right—W. F. Moore, Pittsburgh branch manager; A. R. Warner, secretary the White Co.; W. J. Urquhart, Chicago branch manager; J. A. Bell, retail manager, Chicago branch; E. W. Gans, Atlanta manager. Middle row—J. E. Huggins; Walter C. White, vice-president and sales manager the White Co.; Windsor T. White, president the White Co.; J. Rathbun, New York State district manager. Bottom row—J. A. Howley, Philadelphia branch manager; M. Fellows, Eastern Canada representative; J. S. Hathaway, Boston branch manager; G. A. Urquhart, southwestern district manager; R. H. Johnston, New York branch manager

Entrance to Automobile Show in St. Petersburg

Russia's Great Show

Tsar's Government Favors Rapid Automobile Development and Seeks Type of Vehicles Suited for National Russian Needs

RUSSIA wants automobiles and wants them on a scale commensurate with the extent and resources of Russian territory. The Muscovite empire is the only country where the government is more anxious to have the citizens own automobiles than they are themselves. The transportation problems now arising in connection with the rapid development of agriculture and industry which is taking place in the realm of Tsar Nicholas, are among the most important ones to be solved and must be solved with all possible despatch, and it is the ruling opinion that motor vehicles are to play a decisive part in their solution. The railroads are not numerous, and there is little desire for a railroad development, like that of the United States, which tends to transform all classes of the population into travellers. Russia would rather build highways than gridiron her prairies with steel tracks. It is therefore the intention to give the motor truck something more than a fair field and no favor, so far as the short and the medium length hauls are concerned. The owners of large country estates, in whose domains industrial establishments are also frequently located, take a similar view. They would rather have the railroad station 60 miles away than at their doors, carrying trouble to their little sub-kingdoms. They would like to drive to and from the station in automobiles of their own and at the dizziest clip. The fast automobile suits their average temperament exactly but so far they have not been able to find cars that would stand the gaff of the by-roads, frozen and rutty as they often are. They are earnestly looking for durable trucks and for fast and robust cars and are willing to improve the roads meanwhile as fast as the economical development justifies. In this search and these intentions their government is with them, being composed of men of the same views and standing in need of the same things for military purposes.

The second international automobile show which was held during the closing weeks of May under the arched glass roofs of the spacious Imperial riding school building in Saint Petersburg was an evidence of the energy with which these desires for promoting automobilism and motordom in Russia are followed up; for no exposition of similar scope and importance has been held in any other non-producing country; and Russia has only two small automobile factories of her own.

This show was opened with pomp and ceremony. The picturesque hierarchy of the Russian church, with processions, ikons, chants and invocations, united with state officials to place upon it the stamp of approval from spiritual as well as temporal authority. The French ambassador improved the occasion to have cemented anew the Franco-Russian alliance. An imbroglio with Germany, whose manufacturers are eager for the promising Russian trade and who view with extreme jealousy all the shrewd efforts of the French at monopolizing it on political grounds, was suavely averted.

In all 65 exhibitors bid for the business. They were distributed, according to nationality, as follows:

Germany	26	Belgium	4
France	17	Russia	2
England	9	Switzerland	2
Italy	6	Sweden	2
United States	6	Austria	1

It is admitted by both German and French exhibitors, in so far as their voices have reached the press, that the number of orders booked at the exhibition left a good deal to be desired. Prospective purchasers were still hesitating. American advance agents, on the other hand, report better luck. The comments of a well-informed French visitor may furnish a clue to the understanding of this discrepancy. He says that vehicles must be furnished with all equipment, that the powers from 12 to 20 are at present most readily sold, that the vehicles must have large ground-clearance and that the body must be made to accord with Russian taste and customs, as the purchasers insist upon having plenty of the home color in their conveyances. Those wishing to establish agencies should remember that Russia has two capitals, Petersburg and Moscow. The latter, while not the seat of government any more, is the home of immense fortunes and of much distributed wealth—the better market of the two cities. The Russian car owner is fortunate, he adds, in not being bothered by speed regulations or exhaust smoke ordinances. He must conform to certain traffic rules, and very strictly at that. The police see to it that he does so, but his ignorance of the rules is no crime. Only if any fault on his part causes an accident it goes hard with him.

Accounts Not Secure

One trouble with the trade in Russia, says a German commentator on the situation, is the insecurity of accounts. The Russian merchant is very remiss about paying them on time or at all. Last winter European importers had sad experience of this nature in southern Russia. The merchants had to carry the farmers over, by reason of crop failures, and in turn simply omitted to meet their own obligations. Local committees comprising the more substantial elements among the merchants have now been formed, however, and in conjunction with banking organizations, expect to remedy this situation. Suitable laws are being passed to the same end. It is characteristic that the total of deposits in Russian banks amounted to 1,800 million rubles at the end of 1911 and had risen to 2,200 million rubles at the end of 1912.

Before the opening of Russia's international show—everything ready

THE AUTOMOBILE

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Europe Demonstrates Trucks

ALMOST immediately after the American truck makers announced in unequivocal terms that they do not want any truck shows in New York or Chicago next winter at the time of the passenger car show, England announces that she is resurrecting her truck show after a 3-year sleep and France has announced its exhaustive trials under the direction of the war office. In Europe, every truck maker is up in arms for shows and demonstrations. At Olympia, in London, all space was sold weeks ago and the exhibition gives promise of being the best truck exposition Europe has ever seen. Across the English Channel the military trials in France are going to be record breakers. Already ninety-six trucks and over a dozen tractors are entered.

To America the question is "Are we on the right track?" From indications it would seem that we are not, rather that we are traveling in the opposite direction.

We have closed the doors on shows. We shut the doors last year on competitive demonstrations. What is the result? Today a few truck makers are working very earnestly to make sales. They find it hard work. They are having the same experience European makers had when they closed the doors on shows and trials. American makers are finding out and will continue to find out that shows and competitive demonstrations are good when sanely conducted.

Leverless Gearshifting

THE announcement made in other pages of this issue on the use of the electric gearshift by the Haynes company, one of America's pioneer manufacturers, together with the fact that one of the other leading companies may adopt it, corroborates what THE AUTOMOBILE stated editorially over a month ago, namely, that leverless gearshifters are bound to come just as soon as they can be rendered commercial from a manufacturing viewpoint. It is now a settled question that two concerns will equip them as stock for next season and it has been known definitely for several weeks that a few other concerns have been submitting blueprints to gearshifter concerns, with the avowed object of making such stock equipment for next season.

The leverless gearshifter is bound to come, it is a natural sequent to the self starter, demountable rims and electric lights as well as lighting devices for gas headlight systems. Of these four the leverless gearshifter occupies perhaps first place from the viewpoint of being a work eliminator. There is a hundred times more gearshifting than there is lighting. There are tens of times more gearshifting than starting, particularly in city driving. There are hundreds of times as much gearshifting as tire changing. Because of the great number of gearshifts the leverless gearshifter will be generally welcomed from coast to coast.

When demountable rims were put on the market, it was then argued that woman would be given an opportunity to drive anywhere. The self starter added immeasurably to her cause; but it is questionable if the gearshifter will not be a greater boon than either of them. Gearshifting has often been a hardship with the woman driver, particularly for city driving.

As previously pointed out in these columns, the leverless gearshifter will do excellent service to the car mechanisms, in that there will be more gearshifting than with the lever system. It is but rational to assume that such will be the case, because the movement has been simplified and practically reduced to the automatic zone. Not a few drivers have not shifted gears sufficiently, partly because they objected to being seen making the shift and often because of the difficulty of it. The leverless system will largely remedy this.

The small-capacity motors that are now being fitted together with heavier bodies demand more gearshifting than in the past. The leverless system, it is hoped, will be a step in the accomplishment of this.

The many arguments that were advanced against self starters because of added weight cannot be brought forward in the leverless starter because little additional weight is needed. The battery for operating the gearshifter is the same as used for the starter and the lighting system, and the leverless system has eliminated a few of the mechanical parts and added lighter ones to take their place.

It is difficult to gauge just what the status of leverless gearshifting will be during the next year. Although the electric type has been most in the spotlight recently, other types are coming to the fore and some interesting developments are promised for the future in electric, pneumatic and other types.

England Has Live Engineer Institution

THE Institution of Automobile Engineers of Great Britain, members of which were the guests of the American Society of Automobile Engineers, is an organization of 783 members made up of engineers in motor car factories, professors in colleges, car owners engineeringly inclined and college graduates interested in motor car work. The institution has headquarters at 13 Queene Anne Gate, the center of the consulting engineering world of London.

The Institution of Automobile Engineers used to be known as the Cycle Engineering Institute, but was changed to its present name in 1907, at which time it was incorporated.

The I. A. E., as it is familiarly known, has four grades of members: These are members, 271; associate members, 251; graduates, 219; and associates, forty-two; a total membership of 783.

The work of the society is under the direction of a council of thirty, but the direction and general management rests with the secretary, which position has been held for several years by Basil H. Joy, who devotes a large part of his time to the work of the institution.

The work of the I. A. E. is accomplished by its monthly meetings, held in London from October to June, at each of which one paper is read and discussed. The majority of the papers are prepared by members, but occasionally outsiders are asked to contribute. These papers are carefully criticized and edited before being printed and circulated through the membership prior to the meetings. The average attendance at these monthly meetings is between 175 and 200 and all sessions are very animated.

Basil H. Joy, secretary of the I. A. E.

Although the distances in Great Britain are vastly less than in America, the I. A. E. has found it necessary to organize branches throughout the country for the convenience of those who cannot get to London for the monthly meetings. The North of England branch, which meets at Manchester, covers a zone of country extending north and east of that city. There is being organized at present the Midlands branch, which will hold meetings alternately at Birmingham and Coventry. In addition, the members in Scotland are at present urging the formation of a Scottish branch, with headquarters in Glasgow.

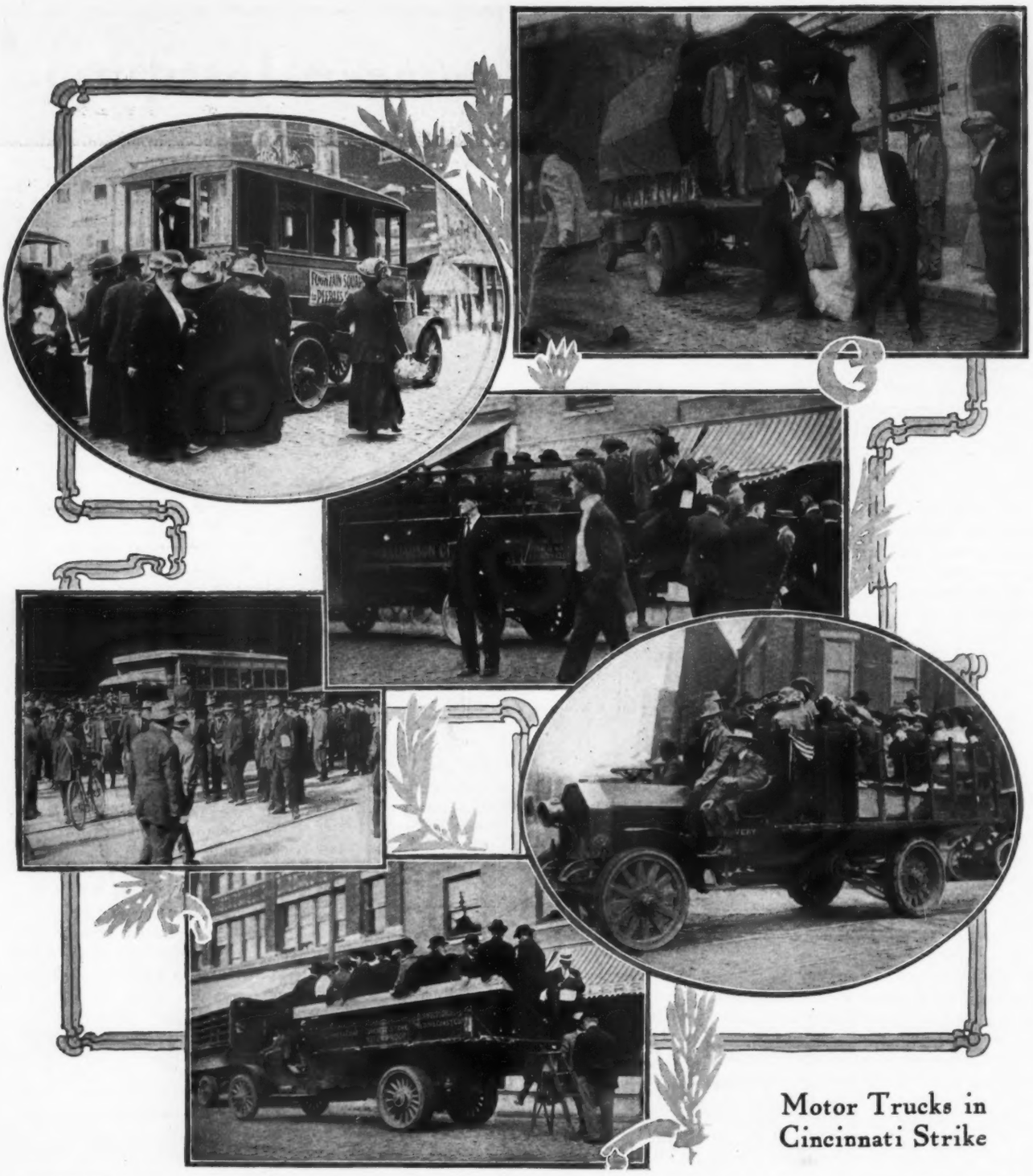
The class of membership designated Graduates has three branches of its division located in London, Coventry and Birmingham. Meetings are held in these centers once a month and the branches have their own chairmen and honorary secretaries. An example of the work done by these graduates was the recent preparation of a series of eight papers by the London graduates dealing consecutively with the steps necessary in the output of 750 chassis, of a 15-horsepower car to be sold at $1,750. One paper dealt with design, the second with purchasing materials, the third with the drawing office, and the others with various aspects of the production of such a vehicle. The series proved of immense interest and led to the graduates securing a vast amount of information on production and design which is not found in text-books.

Another recent work of interest by the graduates was on the training of engineers. The scope of the paper covered the various practical aspects of the question. How should the courses in technical and shop training be arranged? Which should come first? What studies should be included? Should a student be educated in a motor car shop or in a general engineering plant? Various other questions relative to training were taken up and discussed at more or less length.

During the last few years the I. A. E. has given much attention to the training question and has established a bureau of information for the guidance of parents who wish to have their boys take an automobile engineering course. This bureau has compiled the arrangements from the various factories as to their requirements for under-engineers and also the possibilities for graduates in their plants.

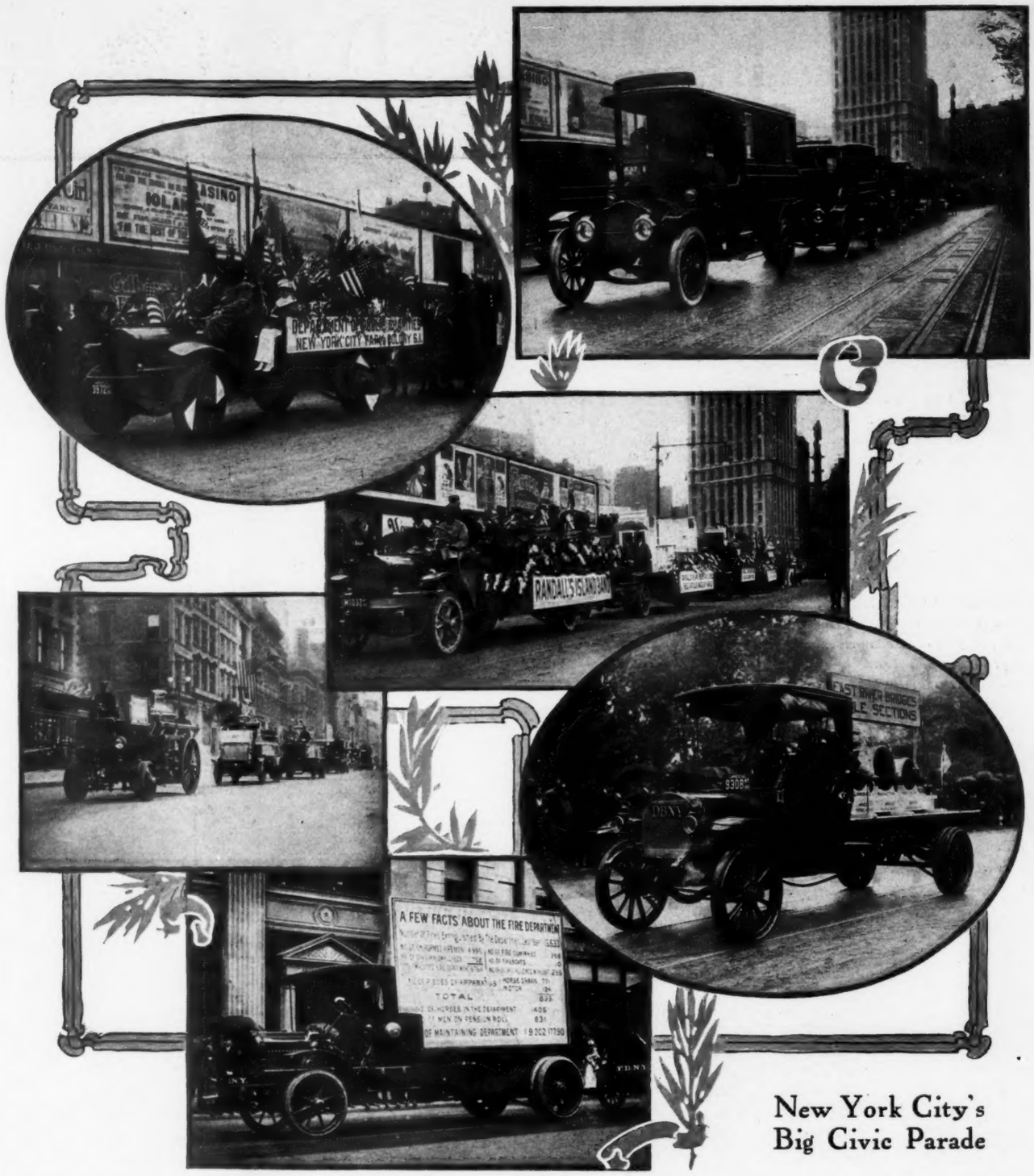
While the major efforts of the American Society of Automobile Engineers have been devoted to the work of standardizing car parts and processes of manufacture, the I. A. E. has not been nearly so active. In fact, it only took this work up actively a year ago. Although the recognized motor engineering institution in England, the work of standardizing motor car parts does not come under the I. A. E., but it is working indirectly to accomplish the same results as the S. A. E. is accomplishing in this country.

In Great Britain the entire work of standardization rests with the Engineers' Standards Committee, a private institution subsidized by the British government and which handles the question of standardizing for the entire nation. It has determined the standard sizes of railroad rail sections, and has gone into the standardization work of all the industries in the land. The committee has been in existence for years. It is divided into sections representing the various industries, one of which is the motor car section appointed last year. The various motor organizations of Great Britain are represented on this section, some of these organizations being the I. A. E., the Royal Automobile Club, the Automobile Association and Motor Union, the Society of Motor Manufacturers and Traders, etc. This section has already met and roughly determined on what parts of the motor car can be standardized. The section then subdivided itself into as many departments as there are car features to be standardized. These sub-committees are collecting data on standard practices of today, so that they can organize these data into a definite report to the Engineers' Standards Committee. The work is progressing much as in America and practically along the same lines, excepting in that the final word on what shall be standardized does not rest with any one automobile organization, but with the main committee of the nation. The 1913 visit to America was the second one of the I. A. E.



Motor Trucks in Cincinnati Strike

CINCINNATI recently experienced one of the most complete st eet car strikes in the history of the country. Not a car wheel turned for days. Then when efforts were made to revive the service with cars manned with strike-breaker crews the sympathizing public refused to ride on the cars. Yet they did not walk. The solution for the thousands who were thus dep ived of street car service was the motor truck. Every motor truck in the city worked either all or part of eve y day as a street car. Motor truck coal wagons, motor truck beer wagons and motor trucks used for any kind of hauling at once became passenger cars, and some of them were earning for their owners as high as $175 a day hauling suburbanites to and from their homes at from 15 to 25 cents a passenger, according to the distance they wished to travel. If it had not been for these swift, modern motor trucks the problem of how to get to and from home, with thousands of people living in suburbs from 5 to 10 miles from their places of employment, would have been a serious one, for not all Cincinnatians own automobiles. Yet it is estimated that the automobile took care of one-fourth of the people who used the street cars before the strike. Motor truck service sprang up 2 hours after the street cars suspended operation. At first only two trucks appeared for duty. The idea of hauling passengers spread like wild fire among motor truck owners, and business firms suddenly realized that a new and highly profitable business was suddenly thrust upon them. The public was quick to appreciate this as can be seen from the illustrations.



New York City's Big Civic Parade

THE Civic Parade held in New York City on May 17 brought out a large percentage of the city's motor vehicles used by the various departments. A majority of the municipal vehicles are propelled by gasoline, while a few are of the electric type. Eighteen different departments were represented by 557 vehicles, a majority of these being self-driven. The total number of fire department vehicles used by the city is 895. About 16 2/3 per cent. are motor-driven, and the rest are horse-drawn. These motor-driven vehicles are divided into fire engines, hose wagons, hose wagon-combination, chemical engine wagons, trucks, supply wagons, ladder wagons, chief's wagons and the water towers. The hospital equipment includes fifty-five vehicles, sixteen of which are electric and the rest gasoline. Much of this equipment is from the factories of the automobile industry where standard chassis are fitted with bodies suitable to the requirements. The police department is represented by eight self-propelled vehicles, one being motor-driven and the rest of the electric type. These are divided into patrol wagons and passenger cars. The lighting and power department uses four trucks, two of them for the men who trim the lamps and the rest in the transportation of supplies. There are five different makes of trucks in service for the waterworks division. These are used in repair work and the transportation of supplies. The sewerage and sanitation equipment consists of two trucks for the transportation of supplies. A few of the departments pay off the employees in automobiles. The government finance division has two wagons in this capacity.

The Engineering Digest

The Making of a Double-Closing Poppet Valve by Near-Automatic Methods—Nervous Motors on Verge of Knocking; Quick Cleaning Saves Them

Cheap Synthetic Acetone Craves Attention of Oil Refiners for Benefit of Motoring Public—Proposed Improvement of Oxy-Acetylene Burners

How the Adler Silent Valve Is Made.—Though the clattering noise arising from the opening and closing of ordinary poppet valves plays only a small part in the general mechanical scheme for silencing the operation of a car—now that the camshaft and the valve are both usually inclosed and the sounds they make therefore muffled—suitable methods for having the valves open and close gently and without making any sound that needs to be muffled are considered of some importance in the matter of avoiding wear, vibration, hammering of the conical valve and valve seat surfaces and disintegration of the valve stem at the weld. The poppet valve design which has been most frequently mentioned as notable in this respect is the one originated at the Adler works at Frankfurt-am-Main. The production methods applied in the making of this valve are now also referred to as an example of advanced German mass-production practice, and the subject thus gains a double interest. The different stages in the manufacture are fully represented in the accompanying illustrations, Figs. 1 to 11. With regard to the principle of the design it may be said that the closure effected by the seating of the mushroom is supplemented by a cylindrical fit of that part which forms the special feature of the valve, and four guide ribs are employed to steer this short cylindrical portion, *h* in Fig. 1, safely into the valve bore in the cylinder wall. The preliminary closing by means of *h* admits of reducing the speed of the subsequent valve motion considerably by means of a very gradual drop-curve of the cam, while the first part of the motion can be as rapid as desired. The rising-curve of the cam can also be made gradual, for the same reason.

Fig. 2 shows the blank for the valve proper. It is cut from bar steel on a slicing-lathe. This blank is dropforged, obtaining the shape shown to the left in Fig. 3, and, after removal of the burr, a piece of half-inch round rod is welded to it, the end of the latter being first slightly upset, as shown in Fig. 3, and the welded piece is then turned down, Fig. 4. The roughing is now done on a lathe with a toolholder holding four tools, one for rough-turning the valve stem *a*, a tool shaped as shown in connection with Fig. 5 for forming the tore *b*, another shaped tool for the outer surface *c*, while a side-cutting edge is used for *d*. A vertical milling machine is used for generating the guide ribs. Fig. 6 indicates the method followed. The valve stem is held in horizontal position between the jaws of a vise secured to the table of the milling machine, and to this table there is also secured a template *Sch* which is moved along a guide rod S. By this arrangement the end mill F which works at a constant distance from the guide rod S, mills the guide ribs out of the material and brings them to the shape shown in Fig. 7.

In Fig. 8 the piece is shown turned down on a screw-cutting lathe so as to be ready for grinding. In order to avoid the forming of a fin at the grinding of the stem, the portion of the latter immediately under the mushroom has been designed 0.2 millimeter smaller in diameter than the final measure of the rest of the stem, which is 9 millimeters. Fixed maximum-and-minimum calipers serve for controlling the exact diametrical dimensions, while the lengths are justified by angle rest fences on the lathe bed.

In order to be able to grind the valve cone, a slot is formed in the valve body as indicated in Fig. 9, the tool used being a circular saw chucked in a horizontal milling machine. The slot in the valve stem is formed in a groove-milling machine, the stem being held in a vise as in Fig. 6. Before the grinding, the valve cone receives its final turning down on a lathe in which the stem is mounted in a self-centering chuck, as in Fig. 10. Thereafter the stem is ground to exact measure, the cone portion being mounted in an exactly fitting sleeve which is secured to the face plate and in the bottom of which there is a projecting rib, corresponding in shape to the slot in the cone valve top and acting as driver and, by a similar arrangement on the face plate of a lathe, the valve stem is finished to exact length, the result of these final processes being shown in Fig. 11.—From *Werkstattatechnik*, May 1.

Analysis of Knocking; Its Cause and the Remedy.—The conservatism of American manufacturers in accepting the modern "nervous" type of motor with long stroke and high compression, and placing it in the hands of the motoring public, only with such deliberate slowness that its peculiarities, relating to operation and maintenance as well as to details of construction, may be mastered gradually, frequently receives indirect commendation in the reports of troubles experienced in those foreign countries, especially France, where the transition from the comfortable low-compression motor of relatively low speed, small valves, rapidly declining volumetric efficiency and indifferent fuel economy to the more modern type has been carried into practice with radical and ruthless consistency by a number of firms whose reputations were still to be made—as compared with those of the few *grandes marques*—and who were satisfied to pin their faith to the undeniable theoretical superiority, in the way of power and fuel saving, which the new type has been shown to possess, and even to possess permanently without any serious accompanying drawbacks, provided the design and construction are just right and care and maintenance are bestowed upon it in some proportion to the more delicate adjustment of the working factors in the motor mechanism.

An analysis of the causes of knocking in modern motors presented by Henri Petit bears on this subject in a popular manner. He writes in substance as follows:

The motors with high compression which are fitted to modern vehicles are subject to a malady of which knocking is one of the symptoms. All drivers know what the knocking of a motor is: That dull sound which the ear perceives when the motor is slowed up by its load and when the spark is too much advanced. It sounds like the blow of a hammer on some soft metal, as lead.

The cause of knocking can nearly always be traced to an abnormal pressure in the combustion chamber at the moment of the explosion and in other cases to abnormal play in the joints of the connecting-rods. Some readers may wonder at the use of the word abnormal with regard to the play. There should,

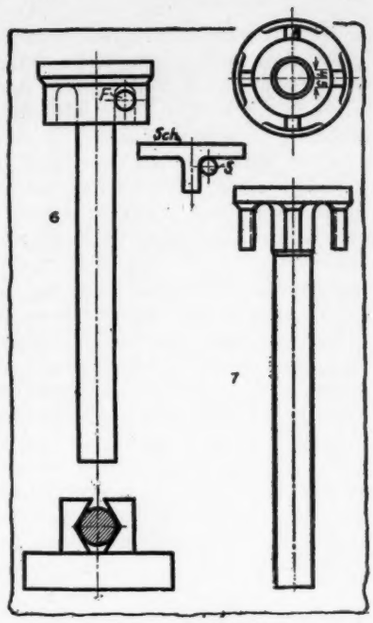
then, normally be some play in these joints, they may say, and yet it has been said and repeated so often that there should be no play at all in the joints of a motor. The fact is this injunction, as may readily be shown, is inaccurate. The movement of two rubbing surfaces is impossible unless there is some play between these surfaces. Imagine, for example, that a solid cylinder A and a hollow cylinder B are made as nearly as possible of the same diameter; say, that the difference in the diameters does not exceed a one-thousandth part of one millimeter. Now, if one tries to insert cylinder A in cylinder B, this operation is found to be radically impossible. If we reduce the diameter of cylinder A until the insertion becomes possible and then measure this new diameter, we find that it is at least 3 to 4 hundredths of a millimeter smaller than it was before. While our senses may not be able to perceive it, there is, then, always play between two perfectly fitted cylinders.

But now, if we coat these two perfectly fitted cylinders with oil, separately, it is again found impossible to insert one in the other. To accomplish the insertion it is necessary to reduce the diameter of the solid cylinder again, this time 6 to 8 hundredths of a millimeter. And if we wish that cylinder A shall be able to revolve readily in cylinder B, lubricated with oil, the play must be still larger.

It is thus clear that the mere fact that the crankshaft can be turned around in the lubricated bearings of an absolutely new motor which never has been worked affords positive proof for the assertion that there is play in all of its joints, but despite of this play one cannot shake the crankshaft in its bushings; by pulling on the connecting-rod, for example. The oil film acts as a veritable cushion and cannot be displaced except by a very violent and prolonged effort. The shock which the rapid combustion of the explosive mixture produces against the top of the piston is not sufficient to shake the joints if the initial play has been suitably calculated and if the lubricant possesses great viscosity.

But if, for one cause or another, the intensity of this shock is increased and if the lubricant becomes too fluid, as will happen when the motor becomes hot, the connecting-rod will be displaced with relation to the shaft, the oil film will be pushed out of joint and the metal of the bearing will be brought in contact with that of the shaft with a blow. Hence the knocking.

The effects of knocking are decidedly destructive. In the first place, the metals brought in contact are, for the moment, no longer lubricated and turn dry for a certain fraction of a revolution. There is sure to be heat generated, and seizing is possible. Besides, each blow produces a flattening of the relatively soft metal of the bushings, which are thereby ovalized. Play produces play, as it is customary to say. A motor which knocks is therefore doomed to rapid deterioration.

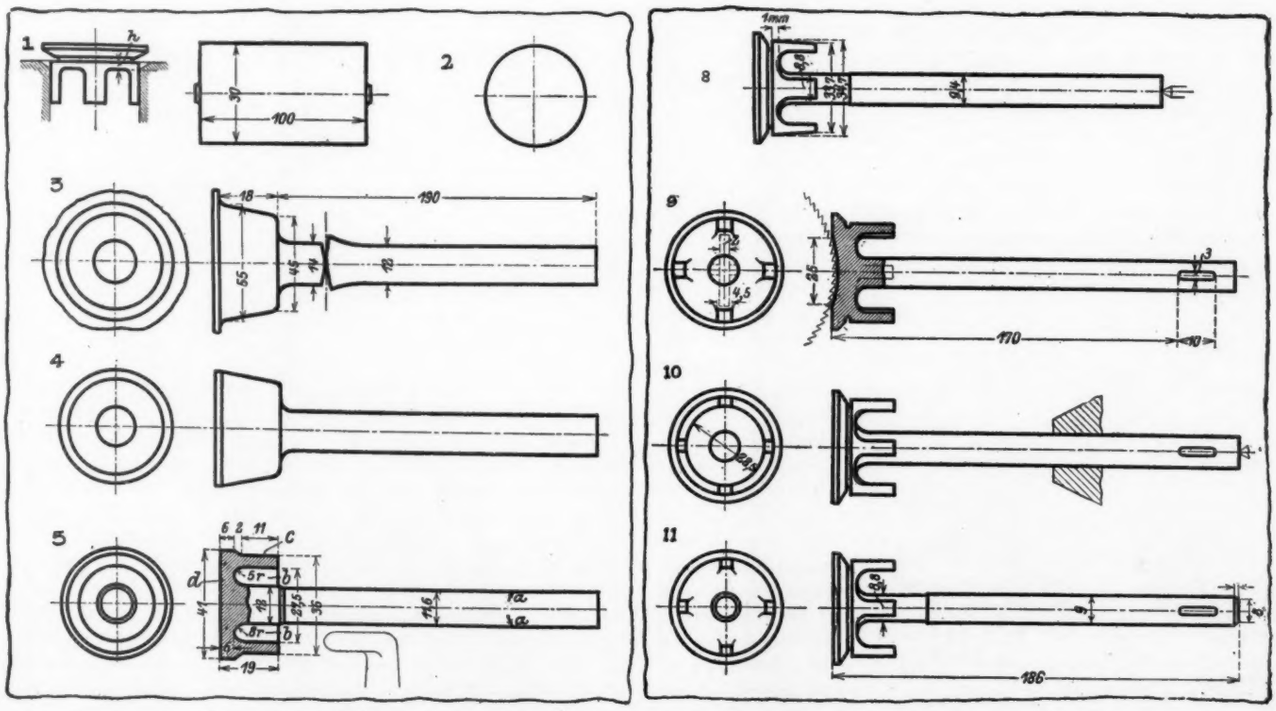


Figs. 6 and 7—An interesting stage in manufacture of Adler valve

It is often ascertained that a motor which does not knock when it is cold, does so when it is hot. In the first place, the pressures in the combustion chambers are usually higher when the motor is hot, but the principal reason is that many lubricating oils lose their vicosity at high temperatures. The film of oil then becomes incapable of resisting the shocks. Lubricants of poor quality are therefore a primary cause of knocking. The oil to be preferred is not the one which is thickest when cold but one which remain viscous when heated. From this point of view castor oil gives remarkable results. [Making it the favorite lubricant for aviation and racing motors, with regard to which it does not matter that the use of this oil necessitates the cleaning of the motor at frequent intervals.—Ed.]

When the play reaches several tenths of a millimeter probably not even the most consistent oil can prevent knocking, and the bearings should be worked over.

It is often found, however, that a motor knocks without any



Figs. 1-5 and 8-11—Type of double-closing poppet valve and progressive stages in the making of it

appreciable play in the joints being traceable. The cause of the evil is then to be sought in the exaggerated pressures arising at the moment of an explosion; and this is by far the most prolific cause of the trouble. The lubricating oil, whatever its quality, always rises somewhat above the tops of the pistons and burns together with the fuel gases. If it burned completely there would be no trouble; on the contrary. But unfortunately the oil is decomposed before it burns, and this causes a fatty and carbonaceous coating to be deposited on the colder walls of the cylinders. The volume of the combustion chambers is reduced by this action. The compression ratio is increased. As the pressure created by an explosion is so much more powerful as the preceding compression has been higher, it can evidently reach a figure for which no provision has been made in the design of the connecting-rod bearings and becomes then in itself a sufficient cause by which knocking may be explained.

A motor of 80 bore and 150 stroke, in which the compression is normally 4.5 kilograms (per square centimeter), may be taken as an example. As the volume of one of the cylinders is about .750 liter, the volume of a compression chamber is found (according to the formula expressing the Mariotte law of inverse proportionality of volumes and pressure) from the equation

$$v = \frac{V}{p-1} = \frac{0.750}{3.5} = 0.210$$

to equal .210 liter. And the surface of the walls of such a compression chamber, including the top of the piston, measures at least 200 square centimeters [assuming the most favorable, semi-spherical shape of the chamber]. If it is now supposed that a layer of carbonaceous precipitate 1 millimeter in thickness has been deposited—which is not exaggerated but often realized in practice—the volume of the deposit aggregates 20 cubic centimeters, and the compression is raised, in accordance with the equation:

$$p = \frac{V+v}{v} = \frac{0.750+0.190}{0.190} = 5$$

to 5 kilograms.

This increase is more than sufficient for making a motor knock which has already run for some ten thousand kilometers, even if its shaft and connecting-rod bearings still appear to be properly adjusted.

The fouling has, besides, too often also another effect. The carbon particles, which are poor conductors of heat, remain incandescent after the explosion, notably in the vicinity of the exhaust valve. They may still be glowing when the piston compresses a fresh charge and may ignite this charge prematurely, thereby causing an energetic knock.

It is perceived from this survey of the factors involved that the gradual fouling of the motor should be attentively watched and, at the first sign of knocking, the trouble should be attributed to this cause rather than to loose bearings. It is easy to ascertain the condition of the compression chamber, if one is in doubt. It is sufficient to unscrew a valve plug and scratch off the black layer which covers the inside. Its thickness is an indication, but it should be remembered that the surface thus brought to light is one of the cleanest in the cylinder head, as it is swept by strong gas currents which counteract the formation of deposits. A much thicker layer will in each case be found on the top of the piston and the bottom of the combustion chamber. The motors with high compression now in use in which heavy fuels can be burned, thanks to their perfected carbureters, need cleaning for every 6,000 or 8,000 kilometers of travel. Formerly the process of cleaning was a serious affair at which one might well hesitate. Time was lost, the cost was high, and the fear that the motor might be remounted defectively was too often justified and made one postpone the operation as long as possible, but now, since it has become established practice to clean by means of oxygen—burning out the deposits—these fears and postponements are no longer in order. In a single hour the motor can be restored to its pristine perfection.—From *La Vie Automobile*, May 31.

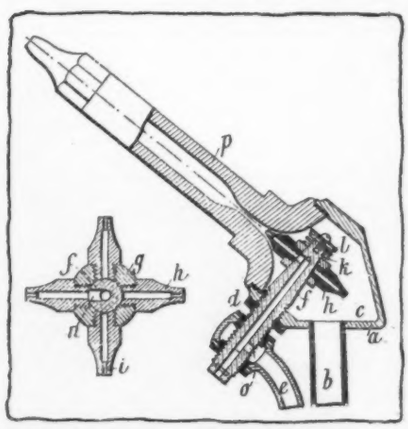


Fig. 12—Burner with variable oxygen feed, for autogenous welding

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SUBSTITUTE for Acetone.—The importance of acetone for the automobile industry depends at present mainly upon two of its established properties. In the first place, acetone absorbs acetylene gas in very large quantities, holding the gas in a small volume as if it were strongly compressed and yet yields it up at a very low pressure suitable for the feeding of acetylene lamps and, for that matter, for acetylene motors, if any such were perfected. Secondly, acetone is a solvent for some of the components of lubricating oil, and it has been shown at the Prussian *Materialprüfungsamt* (Bureau for the Testing of Materials) that, when those components are removed from lubricating oil which are soluble in acetone, the remainder is refined and improved to such an extent that the exhaust gases of a motor in which it is used no longer emit nauseous odors.

Only the cost of acetone has militated against the more extensive use of it for the refinement of oils and other purposes. Among the latter may be mentioned its application as a solvent for acetyl-cellulose in the manufacture of incombustible substitutes for celluloid, for which a market is also being created in the motor industries.

The announcement that a substitute for acetone has now been found which is offered for as low as 21 cents per kilogram, or about one-half of the price of true acetone, is therefore of considerable prospective interest. It is turned out at the Buckau chemical works at Magdeburg, Germany, and from the detailed description of its properties given in *La Technique Moderne* of June 1 it appears to possess all the qualities which eventually should make it valuable for the automobile purposes referred to.

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OXY-ACETYLENE Burner with Variable Oxygen Feed.—It is in some cases useful to be able to modify the proportion of oxygen which is mixed with the acetylene gas in the oxy-acetylene burners used for the quick cutting of metals and for autogenous welding, as usually the modification is effected by means of a petcock placed in the oxygen conduit for this purpose. But this method has the fault of reducing the pressure required at the entrance to the mixing-chamber and therefore also the velocity of the jet which comes out of it. Fig. 12 represents a burner of new design in which this inconvenience is avoided by means of a multiple oxygen jet. The acetylene reaches the mixing chamber *c* of the burner *a* by way of conduit *b*, while the oxygen arrives through tube *e* which ends in a hollow piece *d* from which the cone *f* branches into the mixing-chamber. Upon this cone there is mounted the multiple jet composing a ring *g* (shown separately) in which are inserted the laterally flattened individual jets *h*. This multiple feed device is adjusted upon the cone *f* in such manner that the hole *n* in the latter registers with that one of the jets *h* which should communicate with the nozzle *p* of the burner whose walls it touches; it is held in place by the washer *l* and a spring *k*.

The form of the jets *h* is such that they adjust themselves in the axis of the nozzle *p* automatically, and their flattened form leaves between them and the wall of the nozzle two orifices for the acetylene. As the jets differ in diameter the apparatus admits of modifying the composition of the gas mixture.—From *Maschinenkonstructeur*, April 3.

The Engineers' Forum

Defects in Springs

Never Finds Springs Too Long—Is an Auxiliary Shock-Preventer Necessary?

Downing Thinks Springs Need More Attention
La Porte Believes in Use of Shock Absorbers
Is Problem for Each Car Says Streit

BOTH engineers and readers are taking unusual interest in the discussion arising over the points brought out in the paper by Mr. G. H. Baillee entitled Defects in Springs, which appeared in THE AUTOMOBILE for May 29. Several communications have already been received, three of which follow:

Make All Springs Much Longer—E. Downing.

SAN FRANCISCO, CAL.—Editor THE AUTOMOBILE:—We agree with Mr. Baillee's article in THE AUTOMOBILE for May 29 in which he states that springs have apparently received less attention than any other part of the automobile.

We do a great deal of spring repairing, are said to have the most complete plant for the receiving of machines with broken springs and repairing of them.

As the cars come directly to our factory we have had the best of means to make a study of springs and their weakness in almost every make of car and to apply the same in the manufacture of our guaranteed spring. We find springs too light, too heavy, too short, **but never too long.**

With the carrying of the tires on the rear end of the cars another disturbing element has come into spring construction and from the amount of reconstruction we have done here on the springs of **new cars** the manufacturers have no doubt had the matter called to their attention long before this.—E. DOWNING, President, Hoover Spring Co.

Shock Preventer Is Necessary—LaPorte.

NEW YORK CITY—Editor THE AUTOMOBILE:—Referring to the article entitled Defects in Springs, published in THE AUTOMOBILE for May 29, we believe the author has discussed a subject which is demanding attention of all motorists as well as automobile manufacturers. As pointed out, the suspension system of the automobile has practically remained the same and has not kept pace with the improvements to other parts, so that with increased speeds, efficiency, endurance, power, we still get the bumps, shocks, and general racking caused by the inherent defects of spring suspension. However, it is not due to lack of attention to these parts that there have been no improvements, but to the fact that it is impossible to control the action of the springs without some auxiliary device.

It is evident that springs designed to permit easy riding over smooth pavements will jounce considerably over rougher roads and springs designed for cross-country roads will be entirely too stiff for smooth roads. It is also impossible to design springs that will be as flexible with one or two passengers as with five or seven people. In other words the difficulty in the problem of spring suspension was this: Stiff springs are not flexible enough to absorb comparatively small shocks. They cause considerable vibration of the car when a light load is carried, as their period of oscillation is short, which means that when compressed and released they vibrate rapidly and return to their normal position so quickly as to cause discomfort to the occupants of the car. Very limber springs, on the other hand, to go to the other extreme: When car is loaded or traveling over comparatively rough roads, they allow the body to bounce up and down, as they have a very slow rate of oscillation, also they permit the wheel to jump, thus inducing tire wear, and general chassis depreciation owing to the motor speeding up when the wheels leave the ground. Hence, the necessity of an auxiliary device or shock preventer to control the action of the springs.

So-called shock-absorbers and preventers that depend upon friction for resistance must by virtue of the principle upon which they operate give the same action regardless of road conditions, as they simply stiffen the springs. As pointed out in the article referred to, these devices soon lose their adjustment and are positively of no benefit, but act as a dead weight, therefore our shock preventer has been designed on an entirely different principle. It consists of a series of inclined planes and expanding and contracting disks of firm but resilient rubber which work on the wedge principle. It is not friction but graduated compression of rubber by thoroughly lubricated inclined planes. These planes ride up on each other according to road conditions. Instead of flying back to its normal position the resistance controls the action of the spring, bringing it back to its normal position gradually and preventing the usual jolt and excessive vibration.—CHARLES LA PORTE, Engineer, The Aristos Co.

Commercial Side Rules at Present—Streit.

SEATTLE, WASH.—Editor THE AUTOMOBILE:—Mr. Baillee's remarks sound very well but I fail to see very much in the subject, as he has treated it. It is admitted by all, that automobile manufacturers have not given the attention to the spring suspension which is necessary to a perfect car, but I question whether this matter can be determined on the lines mentioned by Mr. Baillee. It is an admitted fact that none but the high-grade, double-heat-treated spring is suitable for automobile service but this is a matter which must be worked out by the purchasing agent, engineers and spring manufacturers. The hardest proposition, is to induce the purchasing agent to pay the price that will justify the spring maker furnishing a thoroughly dependable spring. If this obstacle can be overcome the road is an easy one, as between the engineer and the spring manufacturer there is no trouble in arriving at a proper grading to carry the passenger comfortably and when this has been determined the tires have secured all of the relief that the spring constructor can afford them. In other words when you have made a spring that will carry the passenger as comfortably as he is entitled to be carried, your springs cannot be made to afford any additional relief to the tires. The spring suspension is a matter which cannot be worked out as applied to automobiles in general, but must be determined for each particular make and model as no two machines that we know of are precisely alike in their weights.—W. E. STREIT.

Sales Department Influences Car Design

From the Paper Read Before the S.A.E. and I.A.E. Visitors by F. E. Moscovics

F. E. MOSKOVICS' offering to the society of a timely paper on the relations between the sales and engineering departments of the motor car factory was productive of a large amount of interesting discussion among the members. The further unity of these departments and better co-operation was advocated. Excerpts from the paper follow:

A few years ago the design of motor cars was practically dictated by the sales department, the engineering department being merely a way station to put the views of the sales department into such technical form as would enable the factory to manufacture a car therefrom. This was due chiefly to the embryonic condition of the industry and also to the fact that substantially all the real executives and heads of factories were themselves salesmen, as well as to the fact that there was no intelligent public demand. The motor car was new; the man in the street did not know what he wanted; horsepower varied from 4 to 120; gearboxes from belt to direct drive. Technical knowledge was as yet unmated with experience—so, naturally, the views and influence of the sales department was dominant and supreme.

Then, a few cars appeared, which due to their great mechanical advances, made a profound impression on the public. The design of these cars was actuated solely and purely by experience; the result was Renault, with light weight and shaft drive; Mercedes, with selective transmission, mechanical valves, cellular radiator, etc. Coincident with the arrival of these cars appeared the awakening of public demand, and, whereas the early engineer taught the public what it ought to have, today the public is surely telling the engineer and manufacturer what it wishes to have, in no silent voice.

About this time the influence of the sales department in the matter of design began to wane a little, in a large degree from the fact that any car on four wheels would sell. It was not so much a matter of which car was best, as what car could be delivered. Now, if we can assume that the day has passed when a customer considers himself fortunate if he can obtain an early delivery; if we take for granted the absolute necessity for stronger-basic work (sound financing, good engineering, efficient production and economic and effective selling); if we can thoroughly grasp the why and wherefore of inter-department economies, and the need of inter-departmental coöperation, and, with these things in mind, grant the advantages that may be attained, we can approach the subject of this paper from a more intelligent angle.

Purpose of Paper

It is not the purpose to attempt to lay down rules or theories of salesmanship except insofar as they affect the relations of the sales department with the engineering department, and the influence that the sales department may bring to bear on the engineering department. In considering the subject certain definite conclusions must be assumed: What is the object of the organization as a whole? Is it to make the greatest mechanical success, regardless of financial results, or to make the greatest financial success—to pay big dividends? Taking the latter as the most logical and sought-for result, obviously, that relationship of the two departments which will tend to create the greatest efficiency of each and of both as a unit is the desirable and ideal. Obviously, again, the greatest car in the world, from a mechanical standpoint, could not be marketed without a sales organization or sales channel of some sort to present it to the prospective buyer nor could the greatest selling organization under Heaven make a permanent selling success of a thoroughly poor and badly engineered car. Accepting this conclusion, then, let us approach the subject from the viewpoint that each department is dependent for sustenance and success on the other, and that each is quite useless without the other, and that the ideal condition is obtained by taking the best ideas of each and molding them to the greatest mutual advantage. If the sales department were fitted and trained to authoritatively inform the engineering department what the trend of the public demand evinced; if the engineering department were, by virtue of its confidence in the views of the sales department, in the receptive frame of mind essential to the acceptance of these views; and if the blended opinion of these two departments fitted in with the production standard that their particular organization was best fitted to handle, would not this nearly approach the ideal?

Co-operation

In many organizations the sales department wears a halo unwarranted by facts, and bad in principle. This is due to many causes, the main one being that it actually brings in the dollars; it is apparently the department that creates the much-sought dividends. Besides it is the department that comes into contact and mixes with the outside world to the greatest extent. It is, or should be, better fitted to tell of its own importance and greatness than any other arm of the business; its business is the art of selling, and it can, or should be able to, sell itself as well as it praises and sells the product at its disposal. In other words, the sales department is the mouthpiece of the organization, the real point of contact between that final judge, the ultimate consumer, and the factory. Naturally, this condition oftimes becomes galling, especially to one so little given to the study of environment as the average motor car engineer. The result is lack of regard for the ideas, views and opinions of one department for the other. Of course, no lasting benefit can come from such a relationship. Each department has its functions; each is all-important to the success of the other. Healthy and deep respect for each other's views in everything that pertains to the welfare of the organization as a whole is requisite to permanent success.

In the past the average sales department has had little real knowledge of the art of motor car building; what it gleaned was of a purely superficial and perfunctory character, usually limited to a parrot-like repetition of a few technical platitudes called for want of a better name "talking points." No systematic attempt was made to thoroughly ground the salesman in the rudiments of the profession, nor did he, for lack of initiative and time, obtain the information on his own account. How few salesmen of even today have a real general knowledge of the basic facts of the business. They have been, and to some extent are still chosen for their appearance, glibness of tongue, and

F. E. Moscovics, who presented the important paper on the influence of the sales department on car design

personality, rather than with due regard to the adaptability to learn, digest and transmit knowledge in a clean-cut manner.

The day is, however, rapidly approaching, if indeed it is not already upon us, when motor cars must be sold and not bought. The buying public become car-wise and knowing what it wants has little respect for or patience with the man who cannot explain in a clear, concise and logical manner the different points of a car that may come up for discussion. The man buying his second or third car has well-defined ideas of his own, and cannot be talked into an unwise investment, nor influenced by mere talking points. The points must be real points, and be well presented. The public craves information in a rational form. The time has passed when anything less will do. This is a day of facts, not fancies. The merely magnetic talker has seen his day.

As illustrating the kind of salesman who cannot succeed today, the following story of a few years ago will perhaps suffice: Jones, the star salesman of a prominent foreign car, was asked by a prospective buyer what form of ignition was used on his car. "Low-tension make-and-break," he responded. "What is the difference between low-tension make-and-break and high tension?" the customer inquired. Jones was momentarily nonplussed (here was a point that his motoring education had not covered), but only for an instant. "Are you an electrical engineer?" he asked. "No, I can't say that I am," Mr. Buyer replied. "Then, really it would be quite useless for me to attempt to explain it to you," said Jones. When Jones told me the story to show how clever he was, I asked him what he would have said if the prospect had said that he *was* an electrical engineer. "Why," said Jones, "I would have told him, 'Then you ought to know more about it than I do.'"

Salesman Must Know

The day of Jones is coming to an end. Naturally, an engineer, who has been brought up on facts, whose entire make-up should be to take nothing for granted, who wants reason (even to an unreasonable degree) for each change of design or model, whose education and training from the university to the factory has been to accept only laws—not fallacies—is not readily impressed by the desire or opinions of sales departments of the type indicated. He feels immediately, and often correctly, that demands born of such scant knowledge are mere shams to cover up its own weakness and an attempt to shunt to his shoulders a responsibility which his own commercial instincts have not, except in a few rare instances, been developed to bear. If, however, backed up by the chief executive he carries his views and ideas, to the exclusion of the other department, he assumes an enormous responsibility, and only discord can result. If, to support his position, he cites his own experience and quotes from the statements of the few users of his product with whom he has come in personal contact, he is treading on very thin ice, indeed. Right here is the pitfall that lures many engineers. They accept too blindly the result of a few experiments or the words of a few persons. What is needed to intelligently guide them is enormous road experience and a knowledge of the demands of hundreds of people. In other words, the average engineer is too provincial and self-satisfied with his work to be in a position to judge what is the desirable and correct design of the future. Is it then any wonder that we see so many cars whose appearance is far below standard?

The blame for this condition should, however, not be charged to the engineer so much as to the executive, who usually loads the engineer down with a mass of work not rightfully within his province. How many engineers are doing the work of chief inspectors, assisting in the purchasing, service and production departments? Few factories provide the engineering department with adequate help of caliber capable of handling properly the detail which the chief engineer feels must be watched by his department, the result, of course, being that the head of the engineering department, while thoroughly familiar with his own product and knowing in a general way the trend of the industry, simply has not the time to follow those niceties and refinements of design and beauty of detail in small things, which the foreign engineer is teaching us, and which are molding public opinion so strongly.

A Proposed Solution

Could the engineer have at his disposal the concrete views of a trained body of men; could these views be presented to him in time to reasonably allow him to get up new designs; could he be placed automatically in closer contact with the user of his car, is it not evident at a glance that enormous benefits and economies would result? It is clear that the economies so necessary to success in the industry today will not allow an organization to have a specially trained corps of men for this work. Where then should the engineering department get its closer contact with the public? Analysis points plainly to the fact that it is through the sales department. Moreover, the bringing of these departments into closer working relation should serve to raise the sales department to a higher standard of knowledge of its own products as well as of those of its competitors, thus enabling it to become more efficient in its own field and more capable of placing intelligently before the engineering department its views of future necessities of design, including comparison of the products of the particular organization and of competitors in actual service. In addition the sales department should grasp more understandingly the large problems of the production department, deterring it from making suggestions which on their face are out of accord with the policies or possibilities of the organization.

Closer Department Contact

Granted that an engineer has a clear-minded and well-trained sales organization to present his car to the public, one that he knows has a very good rudimentary knowledge of the profession, has he not, when it comes to forecasting the demand of the future, an enormous advantage over his brother, who is in constant discord and conflict with his sales department? Generally speaking, the design of a particular car is based on the theory and reason of the engineer. If he cannot impress those nearest to him with the correctness of his theory or the soundness of his reasoning, there must be fallacy somewhere in the organization. If the views of sales departments be subordinated, the chief executive will receive continually communications giving the best excuses in the world why the product is not selling. If it be the engineering department, either a twelfth-hour change is necessary, or, if the matter has been brought up in time, the engineer will be compelled to lay out something against his will and judgment. If, on the other hand, the points of contact between the two departments were such that during the period of inception of the car, the engineer were kept constantly advised of the views and ideas of the sales department, of the success of his product in the hands of the public, would not the resultant product be very much better? Would it not be easier for the sales department to market such a product enthusiastically? Would not the engineer be given confidence that he was building something that the public demanded, and that he was filling a long-felt want? Would not the sales department assist greatly the technical work of the engineer?

Summed up, the problem has two aspects:

First—In the majority of instances there are entirely insufficient points of contact between the sales department and the engineering department.

Second—There are insufficient points of contact between the engineering department and the ultimate user of its product.

How, then, to cure these apparent defects? Surely, an annual

T. C. Pullinger, who told of his experiences in Scotland in the discussion of Mr. Moscovics' paper

meeting where all the salesmen are brought together in a joy-feast is not the place; the chief engineer, let us say, addresses the body; as a whole, the members are known to be gathered merely for the purpose of mutual admiration. The average house organ is not the medium, because truths are not told there; the house organ is usually a means of self-praise rather than self-analysis.

In this paper no consideration is given to the chief executive or the general manager as a factor for the reason that its object is to suggest an automatic means of communication of thoughts and ideas between the two arms of the business, and naturally the supposed superior knowledge of the head of the organization will be superimposed on the hoped-for result of the closer union of these two departments. As there appears to be at present no definite channel through which the two departments can come more closely together, the writer suggests:

First—A weekly engineering bulletin, edited by the chief engineer, taking up in groups the different parts of the vehicle, preferably employing the same nomenclature the factory has given to the various parts, appending the part or piece numbers in question (this will familiarize the salesman with part numbers).

Care Must Be Exercised

Pains should be taken that the bulletin be free from abstruse technical terms and data which might not be easily digested. Care should be taken to inquire whether the salesmen can read simple blueprints; if so, diagrams explaining the theory of the various points should be furnished. The salesman would thus obtain a direct knowledge of the product which he could gain in no other way. In each bulletin a personal appeal should be made to the salesman that he request any information on any point that he does not understand thoroughly, and a further explanation should be cheerfully and gladly given to him. The chief of his department should constantly urge him to correspond directly with the chief engineer on these points, and it should be strongly impressed on his mind that it is no disgrace to come back and say that he does not understand the topic discussed in a certain bulletin. In fact, the writer would urge that upon publication of the bulletin it become mandatory on the part of the salesman to express weekly his view on the topic described.

Although it is argued that the chief engineer be the editor of the bulletin, it is, of course, not necessary that he do the actual work in connection with it. He can lay out topics to be covered, and have his assistant or any other capable person collaborate with him. It is, however, the business of the engineer, to see that the bulletin actually reflects his views and ideas, the object being that the spirit of the organization be built around the chief engineer's conception and theory of the product. He need never be at loss for a topic. If in say twenty weeks he has covered the general points of design, he may then deal with such subjects as economy of fuel, the best means of caring for the clutch, the motor starter, etc. The accessory firms alone could furnish enough data to keep such a bulletin alive for a very long time.

With regard to my second suggestion, contact between the engineer and the owner, the problem is somewhat more simple. The appended form could be sent to every agent and distributor of the factory, with positive instructions that it must be filled out every sixty days. This would give the engineer first-hand information as to exactly how the product is being received. It would enable him to eliminate apparent defects due to local conditions. Let us assume that from the replies it becomes evident that there is considerable noise in the shifting of gears. It is not supposed that the average agent will be able to analyze the clutch problem; that he can tell whether the clutch is too heavy or the gear ratios incorrect. That, of course, remains for the engineer to diagnose. But the replies will place in your hands, without delay, troubles resultant upon design or manufacturing defects. Again, let us assume that the gasoline and oil consumption are very high, much higher than you know should be the case; the service department will instantly get into communication with the dealer and help him to alleviate the condition.

Of course, the theories advanced here, like all theories, are useless, if not used. The object of this article is to point out a means whereby the influence of the sales department on the engineering department can be brought to a stage of intelligent coöperation.

Form for Engineers' Use

It is highly important for your own benefit as well as ours that you give us the following information as accurately as possible. It is our endeavor to make our cars meet the severest general requirements and only by a definite, direct and accurate knowledge of how they act under widely varying conditions can we hope to accomplish this. Please be guided accordingly:

Date:
Agent's name:
Name of territory covered by your company:
How many of our cars are in operation in your territory?
What is mean altitude of territory covered by you?
What is general topography of territory covered by you?
Mountainous
Hilly
Level
Are road conditions good?
If not, please briefly state conditions and about what proportion of roads are macadamized, etc.
What is maximum average temperature?
What is minimum average temperature?

1. Does our line have power enough for your customers? If not, what would you suggest?
2. Is our motor quiet enough for your clientele?
3. Is our line flexible enough?
4. Do our motors accelerate rapidly enough?
5. How do we compare with competitors in our class? Please state which competitors, if any, surpass us.
6. Is the fuel consumption (both oil and gasoline) satisfactory? Please state your experience generally.
7. Are our gears quiet enough for your clients? If not, please state which are noisy.
8. Is the clutch action satisfactory, both as to engagement and holding?
9. Does our spring suspension meet with general approval?
10. Is our steering gear meeting all requirements?
11. Are our gear ratios correct for your territory?
12. Have you heard any criticism of our upholstery, either in material or workmanship?
13. Have you heard any complaint on the accessories we use? If so, please particularize.
14. Have you had any trouble reported on the bearings we use?
15. Is our rear axle construction meeting the requirements of your trade?
16. Please state any general criticism on appearance or general design you may have encountered.

This information is so important to us that we urge it be made out under the direct supervision and be signed by the head of your organization. It will materially help us build better cars.

Marmon Opens Discussion

President Marmon stated that the average engineer is too apt to design a car after his own tastes and in accordance with his ideas of what he would like to ride in.

G. W. Bennett, Willys-Overland Co., said that he has all along advocated a closer relation between the two branches of the business of making motor cars. Antagonism is often found but this is gradually being outlived, a better understanding generally taking its place. The salesman is the connecting link between the factory and the buyer. He teaches the owner and in this way sets the trend of design. Thus, a great influence is wielded by the sales force. If the engineering side will listen to the advice of the sales as to what the future design is to be, the former will get some valuable hints.

J. G. Vincent, of the Packard company, believes that he gets along with his sales department quite well. The engineer will not have any trouble if he is broad minded and always sticks close to the sales and, he believes, it is up to the engineering department to always take carefully the suggestions tendered by the sales department and to analyze these frankly, although, of course, the engineering end must not be swayed too far by these suggestions.

T. C. Pullinger, a leading Scotch maker and a member of the council I. A. E., has also had his troubles in getting the sales and engineering departments to act in harmony. Familiarity breeds contempt, and thus neither department takes much stock in what the other says. The plan adopted by his concern is to get the dealers and agents to meet at the factory and to confer with the organization at regular intervals. The engineering department takes a lot more notice of what these visitors say than they do of what the sales force says.

Once a year Mr. Pullinger's company calls a convention of this kind far enough ahead to give the designers plenty of time to incorporate any valuable suggestion in their new cars. Even earlier than this general dealers' convention, some of the principal dealers come and offer their ideas. These are incorporated in sample cars, which are later shown at the regular dealers' meeting, giving them something concrete to work upon and to criticize.

G. W. Dunham, consulting engineer, Chalmers, outlined the method employed by this Detroit concern in designing according to the public demand. This public "*wants what it wants when it wants it*," he said. To keep closely in touch with the demands, the engineering department is continually asking for criticisms and suggestions from the dealers. To prevent the dealers from writing lengthy letters expressing their views, the company has provided printed forms in pads which may conveniently be placed upon the dealers' desks. They write on these their ideas and send them in along with other communications for the factory, thus doing away with useless words, and saving the designers' time in perusing them.

Besides this, about ten of the largest dealers send in daily reports of all repairs on the cars coming to their shops each day. If the engineering department receives reports of the same defect from several sources, it immediately investigates the breakage, thus being soon aware of any weak part. In this way the engineering department really works in the field itself, said Mr. Dunham. Circular letters are sent out from time to time to the dealers asking for their opinions as to future design and so on.

Mr. Dunham spoke of a mechanics' convention which his factory held. The men were sent from the various dealers' garages in small groups. Meetings were held dealing with all chassis parts and the men were asked for suggestions as to better ways of designing the various parts and were told why certain features were designed as they were. In this way a closer feeling of working together was engendered tending to make the men more interested in the factory's product.

F. P. Nehrbas, American Locomotive Co., advocated the closer relationship of all departments, also. He stated that his company has recently held conventions similar to those outlined by Mr. Dunham, from which great benefit to all concerned was derived. Though Mr. Moskovics' paper was a very full treatment of the subject, Mr. Nehrbas believes that he has touched upon only a small part of a very large subject.

Among the New Books

Works on Iron Analysis, Syndicalism, Automobile Troubles and Their Remedy and Coal Are Among Offerings

Exporters' Encyclopedia Gives Information on All Details Involved in Exporting Goods to Foreign Lands

THERE are many new books coming from the press this spring which are of interest to the automobilist, the manufacturer and dealer, and, indirectly, to all those affiliated in one way or another with the great and growing army of motorists in the United States. The works reviewed in THE AUTOMOBILE this week are of diversified character, the only one directly interesting to the automobile owner being that on Car Troubles, although the treatises on metals and coal will appeal to many and those on syndicalism and exporting are sure to find manifold uses.

METHODS OF IRON ANALYSIS. By Francis C. Philips. Published by the Chemical Publishing Co., Easton, Pa., 170, 9 by 5.5 inch pages. Boards, price, $1.

The methods employed in the laboratories of the different steel works vary to some extent. In view of this fact the methods in use in the iron and steel laboratories around the regions of Pittsburgh, Pa., were collected and published by the Engineers' Society of western Pennsylvania during the year of 1896. The demand for copies of this paper were such that the supply was soon exhausted, and by a resolution of the Society passed in 1897 it was suggested that the transactions be published and bound in permanent form. In this work are collected the methods of analysis used in each of the laboratories around the Pittsburgh region. The principal experiments are for the determination of the presence of silica, iron, manganese, aluminum oxide, phosphorus, sulphur, etc., in ores and in blast furnace cinders. Exact directions are given for the making of each specific analysis. For the iron and steel laboratory the work of this nature is practically indispensable.

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THE IRONMONGER METAL YEAR-BOOK FOR 1913. Published by *The Ironmonger*, London, England, in note book style, 104, 3.7 by 6.3 inch pages. Boards, 2 shillings, 6 pence.

For 7 years the *Ironmonger* has been publishing this annual review of the metal market. The most valuable information that this work contains is the record of the price changes in metal during the year 1912. The closing prices for copper, tin, lead, spelter, pig iron, finished iron, steel, etc., for every day of the year of 1912 is furnished in tabular form. The imports and exports of the principal raw metals are also noted.

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AMERICAN SOCIETY FOR TESTING MATERIALS TRANSACTIONS in four languages: English, German, French and Spanish. Full transactions of the 1912 meeting, published by the Society at the office of the secretary, University of Pennsylvania, Philadelphia, Pa.

Standard specifications for Bessemer steel wheels, open-hearth girder and high T-rails, bridge steel, building steel, ship steel, boiler and fire box steel, axle steel, carbon steel, for wheels, castings and forgings are given in these transactions together with notes on workmanship in these transactions which are complete in all four languages.

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SYNDICALISM. By J. Ramsay MacDonald. Published by the Open Court Publishing Co., Chicago, Ill. 74 pages, printed on deckel-edge paper. Cloth, 60 cents.

A clearly-put exposition of syndicalism, based upon six articles appearing in the *Daily Chronicle*. This book should be read by all students of labor conditions. Syndicalism is organized unionism, its object being the uplift of the workingman by means of arbitration and the strike, on one hand, and by thorough organization on the other. It is non-political and, although some of its principles are the same, it differs from socialism. As the author states, "Socialism asks that economic power should be put in the hands of the community. Syndicalism asks that each industrial group of workers should control the instruments of production which it uses—the railwaymen, railways; the miners, the mines, and so on." As may be gathered from the work it should not be necessary to so clearly define the program of syndicalism, but, to again quote the author, "* * * the geese, having become so familiar with the 'Boo' of socialism that they are beginning to cease to waddle about when it is shouted in their ears, or being frightened out of their lives by the new 'Boo' of syndicalism." On the whole, it is a book worthy of careful perusal.

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EXPORTERS' ENCYCLOPEDIA, 1913 edition, published by Exporters' Encyclopedia Co., New York City. 1024, 5 by 8-inch pages. Cloth, $7.50, including monthly corrections and the *Exporters' Review* for the calendar year.

If you export goods to any foreign country and are not positively familiar with the methods of shipping, a work of this kind will be invaluable. The object of the book is to enable anyone to make a shipment to any foreign country in full security against delays, fines, etc. It tells the nearest and cheapest route, the consular regulations which have to be observed and the exact cost of same and also tells what the transportation companies require in the way of bills of lading, payment of freight, etc. When any regulations or prepayments are necessary it tells how to go about making them and in other words it acts as a standard reference work for the purpose of answering any exporter's or importer's questions.

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CAR TROUBLES—THEIR SYMPTOMS AND THEIR CURE. By Harold Whiting Slauson, M. E., published by Harper and Bros., New York City. Fifteen 3.75 by 6.75-inch pages. Cloth, 25 cents.

Providing the driver knows where to look for the trouble in a general way this little book should be able to complete his investigation for him. The troubles are arranged alphabetically under the heads of clutch, engine, fuel, ignition, and cooling. If there is a knock in your motor and you know it comes from the cooling system you would be able to find it by looking under the latter head. But if you thought the knock came from a bearing, the location could not be found from the book. However, if there is any indication as to the location of the trouble the exact cause can be found by its aid.

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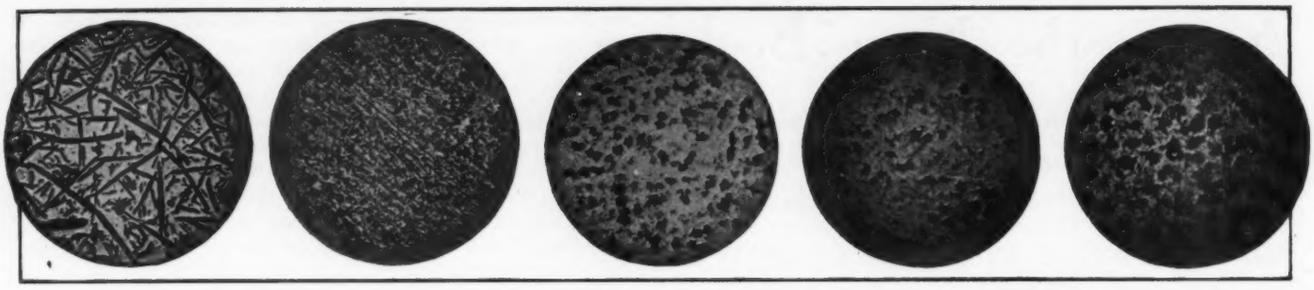
COAL, by Francis H. Wilson, M. Inst. M. E., editor of *Mining Engineering*, published by Sir Isaac Pitman & Sons, London and New York, 129 4.5 by 7 inch pages, with half-tone illustrations. Cloth, 75 cents.

The coal resources of England are carefully studied and analyzed in this little volume. In England more than 1,000,000 people are employed in the coal industry alone. The author deals with the formation and the history of the coal seams, the method of working them, the surface arrangements of the mine and a study of the coal industry. The opening chapter of the work tells of the formation of coal through the decay of vegetation. A thin slice of coal examined under a powerful microscope will often reveal distinct traces of woody tissue and bark. The two theories of how the coal seams happen to form, whether by drift or in situ are expounded. All the varieties of coal are not listed but the different classes of coal are carefully studied. The increase in the economical use of coal is an important feature which the author studies, especially insofar as the use of the coal by-products is concerned. About 35,000,000 tons of coal are consumed every year for domestic purposes and the author quotes Sir W. Ramsay, who states: "We are still utterly wasteful in our consumption of fuel in domestic fires." The book is not too technically written and will make excellent reading for anyone interested in this industry.



Left to right: Fig. 1—Polished section of pig iron. Fig. 2—Polished section of white iron. Figs. 3, 4 and 5—Polished sections of annealed malleable iron

The Use of Malleable Iron for Castings

From the Paper Read Before the S.A.E. and I.A.E. by Enrique Touceda

ALTHOUGH malleable iron, as compared with steel, enters into automobile construction to a limited extent only, the actual amount used in the industry is large. **I believe it will be admitted as a general proposition that the constructing engineer, while very thoroughly posted on carbon and alloy steels, knows less about this material than possibly any other passing through his hands.**

There is a widely prevalent misconception that when any part of a malleable casting exceeds 3/8-inch in thickness of section, the change that normally takes place during the annealing process, whereby the hard and brittle white iron castings that come from the air furnace are converted into soft, tough and ductile ones, is but imperfectly accomplished.

The malleable iron process is conducted in two steps, the first of which consists of melting gray pig iron upon the hearth of an air furnace, when a certain amount of the original silicon, carbon and manganese is oxidized, and thus removed from the iron while it is being melted and subsequently raised high enough in temperature to successfully run the castings. The following three facts are well known to those who possess even an elementary knowledge of the metallurgy of iron and steel:

First, most of the carbon content of gray pig iron exists in the form of graphite; that is, free; if a pig be broken and the fractured end be gone over with a stiff brush, it is easy to thus remove the exposed little flakes of graphite held in mechanical mixture with the iron and always separated from the iron during and for an interval after solidification.

Second, when pig iron is uniformly white in fracture, no graphite is apparent upon inspection; instead of the carbon separating out in whole or in part as graphite, it is all combined with the iron **chemically.**

Treating Pig Iron

Third, a pig iron having most of its carbon in the form of graphite, can be changed into an iron in which none of its carbon will separate out as graphite if this pig iron be melted in such a manner that a certain amount of its silicon content be removed from it through oxidation; for silicon content in excess of a certain amount, prevents the carbon from combining mechanically with the iron; if it be removed gradually from a pig iron in which the carbon would normally have existed as graphite, a point will finally be reached at which its influence in forcing the carbon to separate out as graphite will cease.

It is an easy matter then to start with pig iron that is gray in fracture and in which all or most of the carbon exists as plates of free graphite, and end up with an iron that is white in fracture and in which all of the carbon is combined chemically with the iron; it is a question solely of getting rid of, in the air furnace, such an amount of silicon as will accomplish this end. It thus becomes obvious that the manufacturer of malleable iron castings, by means of his air furnace, experiences no difficulty whatever in converting gray pig iron into white cast iron; which operation constitutes essentially the first step of the process.

Many years ago it was discovered that if hard brittle white iron were surrounded tightly by an oxidizing packing, such as iron oxide in any form, and then raised to and maintained at a temperature of about 1500 degrees Fahrenheit for a few days, it would not only be changed into very soft and ductile iron, but some of its carbon would be removed during the interval. This constitutes the second step in the malleable iron process. Consequently, the first step toward getting soft and delicate castings in the malleable iron process, is to get very hard and very brittle castings, in which all of the carbon is combined chemically with the iron as carbide of iron, the very hardest constituent in either iron or steel. The second step is to break up this hard constituent into carbonless iron and free carbon, both of which are very soft. By the aid of photomicrographs what takes place during the second step of the process, that is, in the annealing ovens where the white and brittle castings are placed to be converted by time and temperature into finished castings, will be explained in a non-technical manner.

Fig. 1 illustrates a polished unetched section of a piece of gray pig iron, the object of which is to show the plates or flakes of graphite that separate from the metallic iron, when the silicon is sufficiently high in the iron to force the carbon thus to separate. It will be noticed that there is practically no regularity of either size or distribution of these flakes; therefore it is not to be wondered at that cast-iron test-bars show great irregularity in strength, even when poured from the same ladle of iron.

Fig. 2 shows a polished section of white iron, white because its silicon content was too low to force any of its carbon to separate out as graphite. The whole of the carbon consequently remains chemically combined with the metallic iron, invariably in the proportion of 6.67 per cent. carbon to 93.33 per cent. iron. This extremely hard carbide of iron is shown mostly in the white areas, but about 12 per cent. of the dark areas consists of this hard constituent also, the reason for which it is not necessary to consider for the purpose of this article.

As previously stated, carbide of iron is the very hardest constituent that can exist in either pig iron or steel, but fortunately, as already indicated, it has been discovered that if it be heated to about 1500 degrees Fahrenheit, for many hours, it can be split into little nodules of free carbon and a mass of practically pure iron, the former being very soft and having no strength, and the latter being both soft and very ductile and possessing high strength. An inspection of the polished sections of annealed malleable iron, Figs. 3, 4 and 5, will show that these little nodules of free carbon (the little

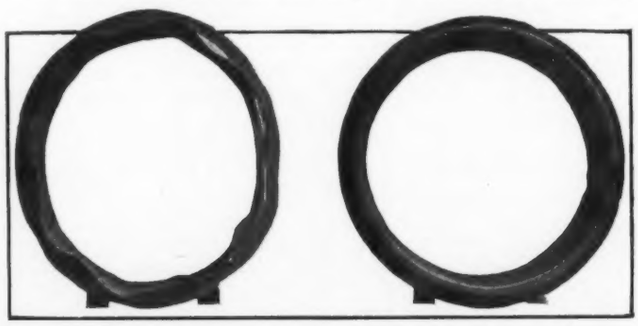


Fig. 6—Malleable iron clutch ring castings tested to prove that carbon particles do not injure the structure of the metal

black areas in the photomicrographs) are very uniformly distributed throughout the entire section and very uniform in size, differing in both particulars from the manner in which the graphite occurs in gray iron.

To contend that white iron castings over ⅜ inch in section cannot be annealed as efficiently as castings of less thickness, is to contend that a piece of white iron over ⅜ inch in section cannot be heated uniformly throughout its entire section to a temperature of 1500 degrees Fahrenheit or over. This is manifestly absurd, for it must be admitted that in many different processes very ponderous pieces of steel are being heated daily throughout their mass to any required temperature. The sole precaution in any case is to see that plenty of time be given the operation. As it happens that in the annealing process in the manufacture of malleable iron castings, some 7 days are consumed from the time the castings enter the ovens until they are withdrawn, if the breaking up of the hard carbide is not complete in the case of thick sections, this is certainly not due to lack of time to allow the piece to heat uniformly throughout. Moreover, there is no trouble whatever in maintaining the temperature of the ovens at any point under 1900 degrees Fahrenheit.

The direct question can now be put:

What is the limit of thickness of section beyond which white iron will not be efficiently and completely annealed; that is, not have all of the very hard constituent completely replaced by little nodules of free carbon and practically pure iron?

The answer is plain. Any thickness of white iron can be thoroughly and uniformly annealed throughout its section that is not so thick that it cannot be heated uniformly throughout, and in which the whole of its carbon content exists as carbide of iron. It has been shown that whether the carbon exists as **carbide** or as **graphite,** is simply a matter of how **low** or how **high** the silicon may be in the casting. It has also been shown that the adjustment of the silicon is under the complete control of the manufacturer. If the silicon is as low as 0.30 per cent. it is possible to obtain very easily sections as thick as 6 inches, in which all of the carbon will exist as carbide of iron, although in this extreme case, to break up all of the carbide and completely replace it with free carbon and iron, a higher temperature than that normally used during the anneal is required. In sections 3 inches thick, all the carbon will exist as carbide of iron when the silicon is around 0.50 per cent., in which event neither a higher temperature nor a longer anneal than is customary in ordinary practice will be required. I have therefore placed this as the limit of thickness for efficient and complete annealing. The trade, however, does not call for malleable iron in which the sections are this heavy. The statement can be made that if the process is fully understood by the manufacturer, and he will adjust the silicon content in accordance with the heaviness of the work, no trouble from this source should exist, and none ever will.

Referring again to Figs. 3, 4 and 5, I would explain that these photomicrographs were taken from an annealed malleable section 2 inches in diameter and several inches long. The sample was cast at my request from a heat in the regular course of work. While the company makes fairly heavy castings, none of the parts approaches this sample in thickness. Still, as will be seen, the silicon in their white iron was low enough to cause all of the carbon to form carbide of iron in a 2-inch round. This sample was annealed in the oven with their own castings in exact accordance with their regular practice. Fig. 3 was photographed at a spot about ⅛ inch from the surface; Fig. 4, at a spot midway between the surface and the center, and Fig. 5 directly at the center.

A close inspection and comparison of these three photographs should satisfy the most skeptical that this piece was annealed with completeness throughout, and that all of the hard carbide was broken up into free carbon and soft iron. Accompanying this sample was another of 4 inches diameter, the central part of which I found contained considerable graphite in the form of flakes, which from their shape could be identified as having resulted from the separation of some of the carbon during the solidification of the white iron, showing that in this case the silicon in the normal mixture was not sufficiently low to have forced all of the carbon to combine with the iron, although had the silicon been somewhat lower, no difficulty in this particular would have been experienced.

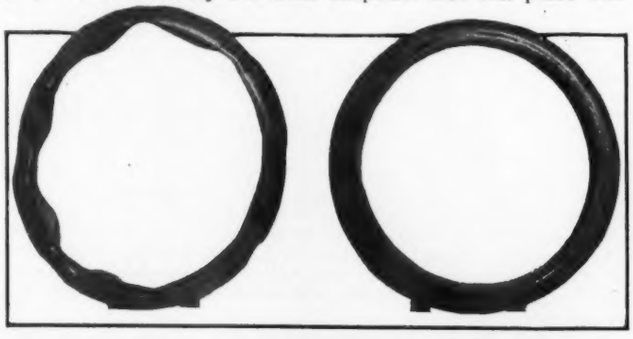


Fig. 7—Clutch ring casting after testing by machining down to ⅛ inch and subjecting to heavy blows with a hammer

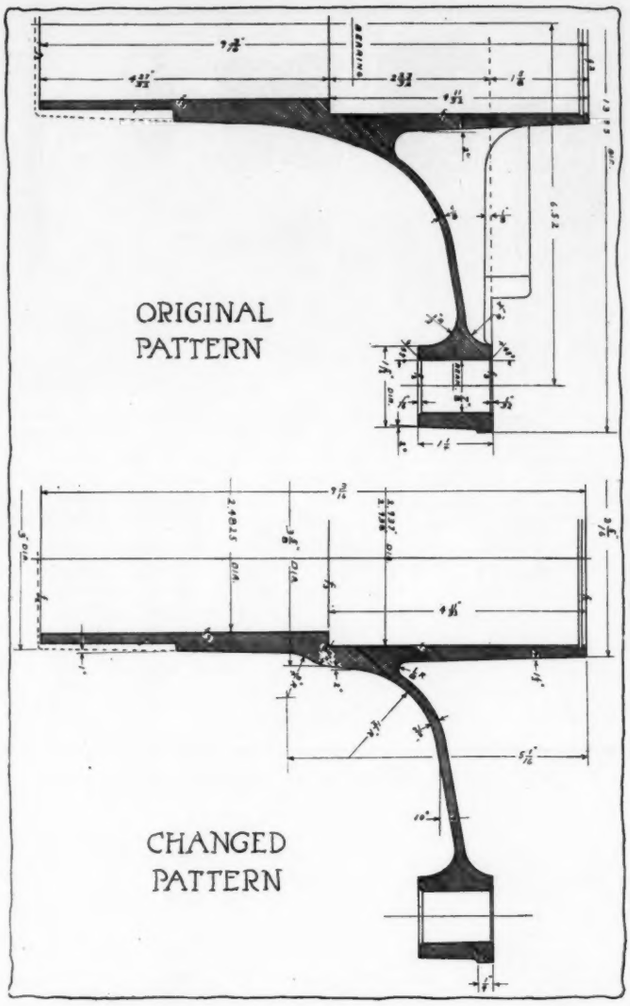


Fig. 8—The slight changes made in the pattern transformed the casting from a failure into a success

Removing the Skin

In connection with the oft-repeated statement that if the skin of a malleable casting be removed, and the core tested, the latter will be found to be more or less worthless and that malleable castings are strong and ductile by virtue principally of the metal in the skin, there is no question whatever that the metal in the skin of well-made malleable iron is slightly superior to that which constitutes the main bulk of the casting, but only in the case of very poor malleable iron can a really great difference in strength between skin and core be noted; the poorer the malleable the more pronouncd this difference. Malleable castings are not unique in this particular, for the metal in the skin of most steel castings is stronger than the central part of the casting, although not for the same reason that obtains in the case of malleable iron. The skin of malleable castings is practically decarbonized iron, the structure being uninterrupted by the presence of any little nodules of free carbon. The structure of the core, however, differs from that of the skin, only in that throughout it little nodules of free carbon are interspersed. That in good malleable iron these little particles of free carbon do not act in

Fig. 11—Some castings which show signs of abuse

a way to injure the structure to any appreciable extent, I have satisfied myself by numerous tests conducted from time to time.

To illustrate this fact, I have secured two castings of an automobile clutch ring, Figs. 6 and 7. The 7/16 inch thick rim of the casting was machined down to a thickness of ⅛ inch, after which it was subjected to repeated heavy blows with a hammer to test the ductility and strength of the core left after machining. It will be seen that the metal of the core, in this instance, was of great strength and ductility, able to withstand great punishment without developing cracks of any magnitude. It is most likely true that the metal in the skin of this casting was slightly superior to that in the core, but I feel confident that the difference was not great, and I repeat that in good malleable castings, while the metal in the skin is a little superior to that of the core, the difference is but slight. The photographs referred to speak for themselves.

Status of the Industry

Some in the business have not kept pace with the advances made in malleable practice; some do not even understand the rationale of the process, or lack good manufacturing equipment. While fortunately these do not predominate, there are enough of them to throw much undeserved discredit on one of our large important growing industries. I am convinced, however, that the constructing engineer has, owing to improperly designed patterns, contributed unintentionally in numerous instances, to this situation. The worst offenders in this particular are the engineers for the railway car builders.

If the question of shrinkage and contraction be not properly considered, if the apportioning of thick to thin sections be not adjusted in accordance with correct principles, no matter how superior may be the metal *per se*, failure is the certain outcome. The remedy should be obvious. Practically all of the makers of malleable castings have on their staff men who are very proficient in the design of patterns from which to cast malleable. Much delay, much irritation, and a great deal of injustice will be eliminated, and a much stronger casting for the same weight of metal will often be produced, when closer relationship and co-operation exist between the engineer who designs a malleable part for any particular machine and the malleable pattern-maker at the foundry.

Lack of time has prevented my securing more glowing examples than the ones here shown, of how small need be the alteration in a pattern, in many instances, to produce good

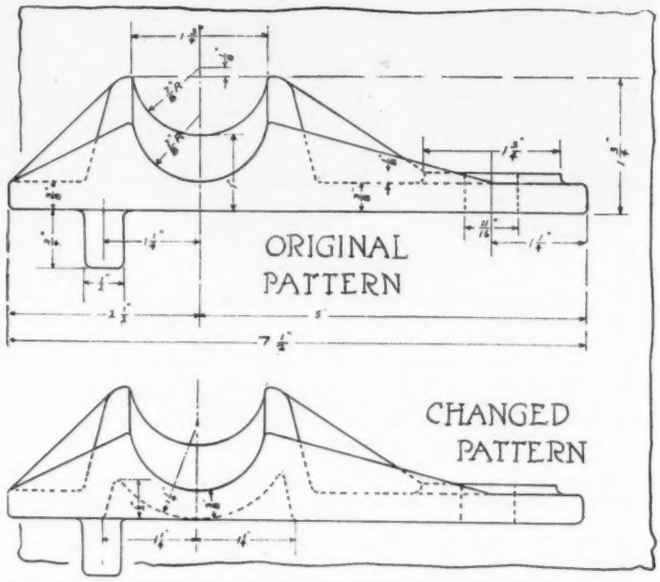


Fig. 9—The changes made in this pattern not only made a better casting but also reduced the amount of metal required

results where bad ones previously obtained. The changes shown in Fig. 8, although very slight indeed, made the difference between success and failure. The same remark holds good in the case of Fig. 9, the change producing not only a satisfactory casting, but one containing less metal. In connection with the center plate shown in Fig. 10, the following are the facts: Complaint was made by the railroad that these malleable castings were failing in service. The manufacturer of the castings made the request that he be permitted to alter the patterns in accordance with what his experience indicated would remedy the trouble. This privilege was not granted. The road then decided that malleable iron castings could not be depended upon in this particular case; so it was decided to have the castings made of steel. The steel men also objected to the design of the pattern, and, as almost always happens when a change is made from malleable iron to steel, were allowed not only the privilege denied before, but, as can be seen by reference to the drawing, were permitted to thicken the sections by one-quarter of an inch almost throughout. That changes were made in both design and weight is soon forgotten, but not that the steel casting stood up to the work and the malleable casting failed.

Physical Properties of Malleable Iron

As to the physical characteristics of malleable iron, I know that you are all familiar. However, at the end of this paper are reproduced some photographs of heavy malleable castings that you will acknowledge have been severely abused. They very eloquently illustrate the fact that when malleable castings are made by those who understand the process, castings that possess many valuable characteristics are produced. When toughness and ductility, ease of machining and low cost are considered, I do not know what metal can compete successfully with good malleable iron.

The tensile strength of good malleable iron will vary between about 38,000 to 56,000 pounds per square inch. When extreme ductility is desired, it is manifestly incompatible to specify high tensile strength. As in the case with carbon steel, so with malleable iron, ductility goes hand in hand with low ultimate strength; if high ultimate strength is desired, it can be obtained only by a sacrifice of ductility.

The elastic limit of good or of even indifferent malleable iron is equal to that of wrought iron and frequently exceeds it. When comparisons are made between this material and other metals, it would be more fair to consider the elastic limit rather than the ultimate strength, for it is the former upon which the engineer actually bases his calculations. The elongation and reduction of area of malleable are, of course, considerably less than of either wrought iron or soft steel. That both of these properties are high enough to impart great value to malleable castings is impressively attested by the photographs of the abused castings previously referred to.

It is the custom in plants of fair size to run various furnaces on mixtures for different classes of work. The mixture from one furnace is not as well adapted to one class of

casting as to some other. If the user of the castings will only take the manufacturer into his confidence and explain the use to which any particular casting is to be put, the work expected of it in service, I know that loss of time will be avoided, and a more superior product had. Some consumers are under the false impression that for competitive reasons they should lighten their castings. This generally necessitates the introduction of more cores in the mold, the result being that the manufacturer is obliged to charge more per pound.

Specification for Malleable Iron

I presume that specification is of more interest to the membership than perhaps any other one question in connection with this material. I have no desire to usurp the duties of the committee having this matter in hand, the work of which in all that has been done has been so commendable, but a few words in connection with the S. A. E. malleable iron specification will I trust be taken in the spirit in which they are intended.* I believe that a mistake has been made in specifying an upper limit for silicon. As a matter of fact, it is well known that the higher the silicon in the white iron casting, provided the totality of the carbon in the casting exists in the state of carbide of iron, and all other conditions are correct, the better will be the finished product. I have shown that the manufacturer is obliged to eliminate his silicon to a point where all of the carbon will remain as carbide, and also that the extent to which he must carry out this elimination depends wholly upon the heaviness of the sections. It is exceedingly rare that he errs in getting the silicon too high, because he does not need a chemical analysis to safeguard this, as all that he has to do is to keep breaking his test sprue until he sees by the fracture that the iron is white, and that there are no particles of graphitic carbon in the fracture. He is more concerned in this particular than the purchaser can ever be, and to this extent the purchaser is protected. To specify an upper limit for silicon is about as necessary as to specify that the manufacturer shall pour his iron in the molds at a temperature sufficiently high to successfully run his castings. You can rest assured that he is going to look after the upper limit of silicon with as much fidelity as he will to be sure that the iron is hot enough to avoid trouble through misruns.

On the other hand, it would be wise to specify a limit beyond which the silicon shall not drop, because not only does the manufacturer err frequently in this direction in the making of black heart iron, but he is handicapped by having no reliable means of telling just when he is on the danger line. Analysis would take too long and the fracture gives no true indication. If the silicon is too low, a very inferior product will result, and still the purchaser if he be held to his specification can be forced to accept the castings.

The S. A. E. specification allows the manganese to be as high as 0.70 per cent. No one ever saw and no one ever will see black heart malleable iron of good quality with such a manganese content. Provided certain precautions are taken, and certain ratios made between certain elements in the product, it is possible to make a good product in which the manganese might be as high as 0.40 per cent., but to do so the manufacturer would have to be a master of his business and to know how to offset the evil effect of manganese on the structure.

Limit for Phosphorus

The upper limit for phosphorus given (0.20 per cent.) is all right, but it is actually the extreme upper limit that should be tolerated. The Society for Testing Materials allows 0.225 per cent. as an upper limit for phosphorus, but this is by far too high. I feel very confident that a good product could not be obtained if this limit were reached.

No mention is made in the S. A. E. specification as to carbon content, or the permissible amount of combined carbon tolerated; nor is any limit placed upon the allowable amount of total carbon.

Were not this paper already too long, I would like to make some comment upon the question of test bars for the determination of physical properties, etc. This can be taken up in a subsequent paper, if the matter proves of sufficient interest.

*The S. A. E. specifications for malleable iron are as follows:

Manganese	.30 to .79	Phosphorus	Not over .20
Silicon	not over 1.00	Sulphur	Not over .06

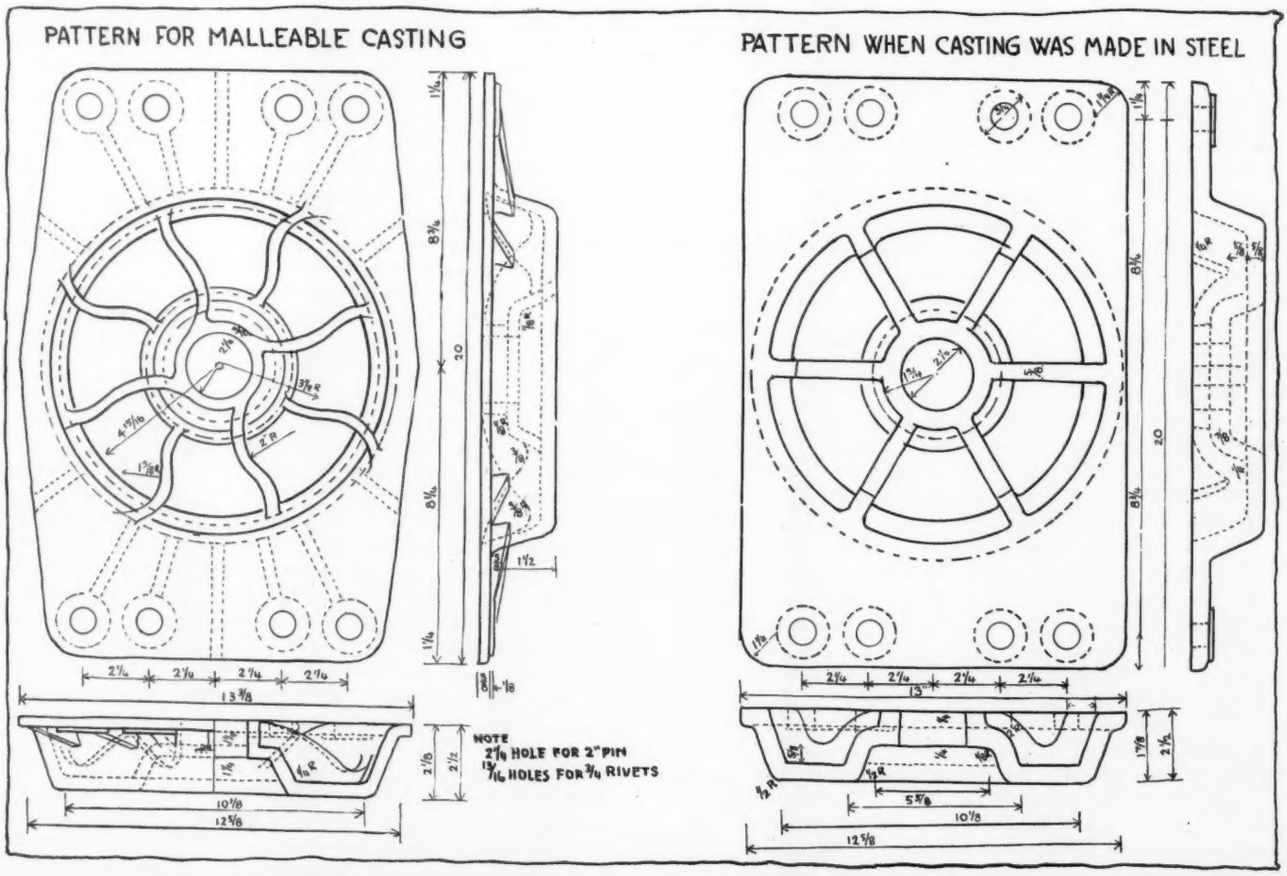


Fig. 10—The malleable iron casting shown above was a failure. The makers wanted to change the pattern, but the work was turned over to steel casting makers who were permitted, however, to change the pattern as shown. The changes are significant

The Rostrum

In which Letters from Readers Are Answered and Discussed

Broken Piston Ring Causes Trouble—Dirty Multiple-Disk Clutch Chatters—Discussing Location of Gearbox—Kerosene Through Intake Pipe—Chokes on Account of Heavy Fuel—Clearance Used in the Piston Rings

Sounds Like Broken Ring

EDITOR THE AUTOMOBILE:—Recently I overhauled my engine, ground the valves and set it up again. It was very stiff to crank, but I thought that was nothing. The engine ran for half an hour without any knocking, but the next morning when I wanted to crank it I could not. It was locked tight. Now, what was wrong? This is the first one I ever overhauled that has acted like this. I do not want to take the engine down if I can help it. I think a ring is broken or out of place.

Pittsburgh, Pa. G. P. KISTNER.

—As you do not give the make of your motor nor mention the condition under which it was run after overhauling, it is somewhat difficult to make a certain diagnosis of the case. It is not likely that the trouble is in the piston rings. Of course, this is possible, but it is more probable that the motor did not have sufficient oil when you ran it after overhauling. When a motor runs dry it does not take long for it to stick. The only thing to do is to try to loosen the pistons by putting a mixture of oil and kerosene, the kerosene predominating, in the tops of the cylinders either through the petcocks or valve caps. Then try to work the flywheel back and forth. To do this you may have to use a large wrench or you may be able to work it loose by hand. If you are unable to loosen the motor by this means it will probably be necessary to rig a block and fall and lift the cylinders off the pistons. Of course, if piston rings are broken or out of place it will be necessary to take down the motor anyway. We should be interested to hear of further developments in this case.

Clutch Needs Cleaning Out

Editor THE AUTOMOBILE:—I have a multiple-disk clutch running in oil on a car of a well-known make. When I let in the clutch it takes hold harshly and causes the car to quiver, jump and jerk and makes an awful noise. I have changed the oil a couple of times. Last time I put in powdered graphite and it seems to be worse. Please let me know a remedy for this.

McKeesport, Pa. AUSTIN CONRAD.

—Very often this trouble can be cured by giving the multiple-disk clutch a thorough bath in kerosene and gasoline. Mix the kerosene and gasoline about half and half and pour through the plug in the clutch housing. There will generally be a plug at the top of the housing, as in Fig. 1, through which the cleansing material may be poured. Fill the clutch housing to the top and then let the motor run idle for some time before draining out. If there is any connection between the crankcase clutch and gearbox housing, all three, or as many as are interconnected, will then have to be drained out because the kerosene and gasoline cut the lubricant and would leave the bearings dry if they were not drained out and then refilled with fresh oil.

Where there is any connnection between the clutch housing and the crankcase, heavy grease should never be used because it will surely work up into the cylinders and carbonize.

Likes Gearbox on Rear Axle

Editor THE AUTOMOBILE:—As a car owner, I take pleasure in taking part in the interesting discussion now going on in THE AUTOMOBILE regarding gearbox location.

Let me state first that I favor the rear-axle location. I will take up the various arguments against this location and try to show that they are not well founded.

First, it is claimed that the greater weight of the rear-axle construction causes greater tire wear owing to its being unsprung weight. This I do not find to be the case, a set of tires running as far on my rear wheels as on the front. It think it is a good thing to have an unsprung rear axle heavy enough to hold down the wheels while traveling on rough roads, whereas with a light axle the wheels are in contact with the road only part of the time, thereby causing greater liability of stone-bruise, friction between the tire and road and increasing the tendency to skid. I am an advocate of Charles Duryea's doctrine of "most weight on the rear axle." The idea of a unit power plant seems to me as foolish as would that of putting the driving wheels of a locomotive under the tender and trying to push the heavy boiler ahead of them.

Second, as to accessibility, I find that by taking up the floorboards of the rear seat that the rear-axle gearset is in as "get-at-able" a position as it can possibly be located, opinions of manufacturers to the contrary notwithstanding.

Third, it has been argued that a rear-axle gearset would wear out quickly on account of the strains and vibration to which it is subjected. As to this, I submit that all shaft-driven cars have unsprung bevel gears and differentials. If these can be built to stand the strain of the rear-axle location, why not the gearset also?

To sum up: I find the gearset as a unit with the motor bad, because it puts too much weight over the front wheels where it increases the tendency to skid and makes a hard car to steer. It would be just as reasonable to put on a pair of roller skates and try to push a heavy load in front of you. The amidships position is on the whole to be preferred to the unit construction, but even this position has several conspicuous disadvantages, among which are the necessity for using two or three heavy universals, which use up power and add complication, the necessity for heavy cross-members to support the gearset, and the inaccessibility of the clutch.

As to the control of the rear-axle gearset, it has been stated that long connections are necessary between the levers and gearbox and some designers and engineers seem to think that this is a great disadvantage and a very complicated arrangement. That comparatively long rods are necessary with present-day control I admit, but I can see nothing complicated or objectionable about a couple of light steel rods whose length is unalterable unless they are bent, an accident very unlikely to happen because they are located in the most protected position possible. The brakes of most cars are operated by rods much longer than

those required for the rear-axle gearset, yet no one ever thought of putting the brakes on the front wheels for this reason.

This question of gearbox location is one of the greatest importance and is by no means settled, different engineers of the highest reputation holding entirely different views; yet in the long run it is the motoring public, the user and not the creator of cars, that settles such questions, and as one who has been following the sport of motoring since its inception these opinions are respectfully submitted.

East Canaan, Conn. DEWEY C. CANFIELD.

Tough on Tarrytown Canines

Editor THE AUTOMOBILE:—You should without delay publish a warning to all motorists with dogs not to pass through or stop in Tarrytown with them, as a quarantine for rabies is being rigidly inforced here. The deputy sheriffs are taking unmuzzled pups from all vehicles and the process of getting them back from the pound is a long and costly one.

Tarrytown, N. Y. MRS. HARRY MICHENER.

Proper Piston Ring Circumference

Editor THE AUTOMOBILE:—1—In fitting new rings to the piston, should the rings be fitted tight to the cylinder walls or should there be a little play left for expansion? If so, how much would this be at the ring joint or lap?

2—How many degrees past upper dead center should the piston be when engine fires or when spark takes place with spark fully retarded? If possible state distance in inches on flywheel.

Spokane, Wash. NOVICE.

—1—Piston ring circumference will vary with the condition of the ring. That is, when the ring is new and cold it will be different than when new and hot, etc. To make a standard comparison of the proper space between the ends of the ring the standard condition of a new cold ring may be taken. A ring under these circumstances should have a space between the ends as shown in Fig. 1 of from .0025 to .003 inch per inch of diameter. This may seem large but when it is known that the expansion of the rings in a circumferential direction is .00001 inch for every inch of ring per degree raise of heat it will not seem too much. Take, for instance, a 3-inch ring. It will have a circumference of very close to 10 inches. Taking 10 inches as an arbitrary figure for the circumference of the ring, we would have, with a raise of 500 degrees in temperature:

$$\text{Expansion} = 10 \text{ inches} \times .00001 \times 500 = .05 \text{ inch}$$

This would seem to be enough to cause the ring to buckle because the allowance according to the above figures would only be about .009 inch at the split for a 3-inch ring. We must remember, however, that the cylinder also expands, causing the ring to spread to a larger diameter which goes to neutralize a large part of the .05 inch of straight linear expansion.

We have no authority for taking 500 degrees as the working temperature above cold because the heat variations are so complex and the changes so quick that the highest temperature of the ring would perhaps be merely a skin temperature and the interior of the ring would be cooler. These figures, however, are food for thought and your question is answered under the direct statement that practice allows .0025 to .003 inch of clearance per inch of ring.

2—It is very seldom that the full retard on a motor allows the spark to take place later than the upper dead center. As can readily be seen, there is no reason that it should because even if the motor were turning over exceptionally slowly nothing would be gained and some power and efficiency would be lost. If the spark occurs exactly at upper dead center, owing to the appreciable lag due to the commencement of the propagation of the flame, the crank will have turned over slightly and the power will be exerted in the proper direction without a knock.

Needs Larger Gasoline Spray Nozzle

Editor THE AUTOMOBILE:—In regard to Mr. Webb's trouble as printed last week, I have had and am still having the identical experience with a car equipped with a Zenith carbureter. My car (Gregoire 18 horsepower) was built in 1910 and the carbureter was probably built for 1910 gasoline. I have had my cylinders rebuilt as you suggested to Mr. Webb, and did not in any way improve matters. It is my opinion that both of these machines (his and mine) are not getting enough gasoline and that enlarging the spray nozzle in the carbureter will help. If Mr. Webb wishes to know the results of my experience I will be glad to let him know.

As to Mr. De Luke's trouble, if he had a 30 by 4 tire instead of a 30 by 3.5 he would have had an awful job getting it on and a worse one getting it off, as a 30 by 4 tire is smaller on its inside diameter than a 30 by 3.5.

New York, N. Y. GEORGE OPPENHEIMER.

Late Spark Heats Motor Badly

Editor THE AUTOMOBILE:—I would like to know the probable cause of excessive heating of water in radiator and motor, and how to avoid it. I have a 30-horsepower Reo, four-cylinder touring car of late 1911 model, which has been used very little. but I find that when on short runs, say of 15 or 20 minutes, at

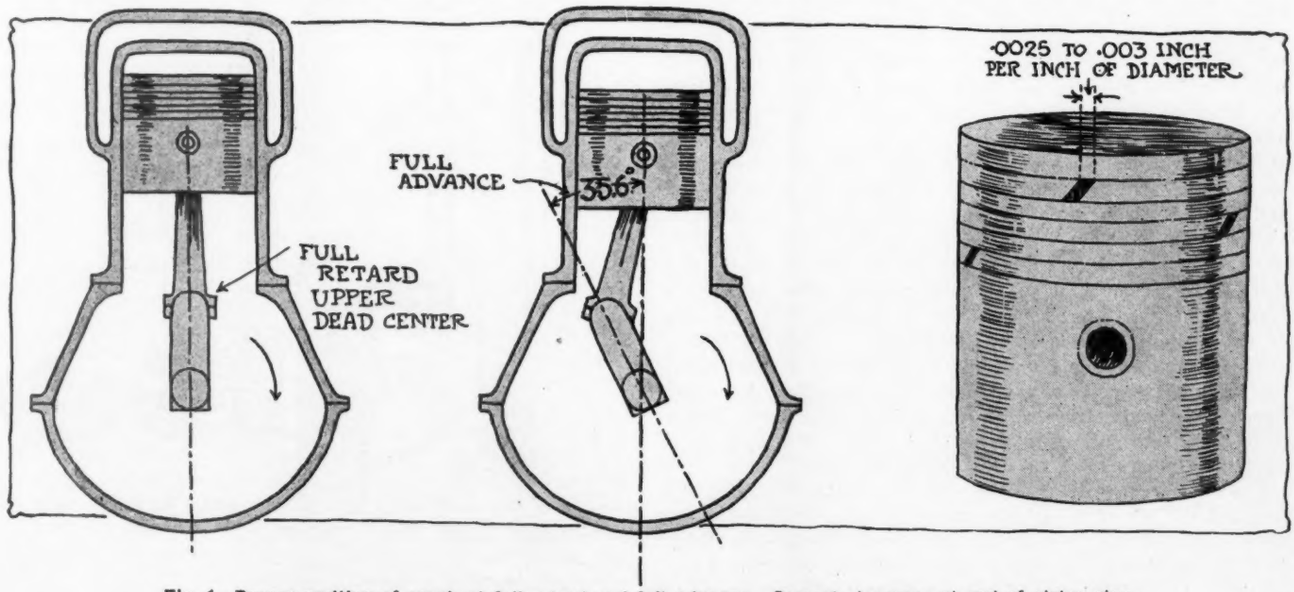


Fig. 1—Proper position of crank at full retard and full advance. Correct clearance at end of piston ring

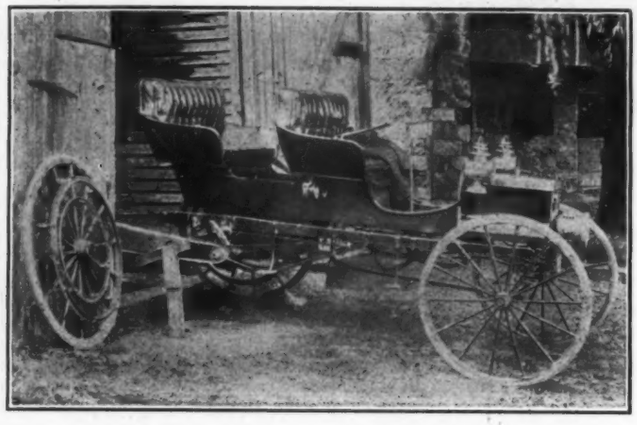


Fig. 2—Duryea Buggyaut rigged for stationary power purposes

a speed of 10 or 12 miles per hour, the water in the radiator is boiling and the heat uncomfortable for the occupant on the front seat, and another strange feature is that the switch removable handle (National Coil Co.) gets much hotter than the surrounding metal.

Yesterday the car stopped in some loose sand and when I tried to crank it to start again I could not turn it over, and came to the conclusion that the heat was so great that the pistons had expanded so as to bind them; for after the motor had cooled off to a certain extent I had no trouble in doing so.

Now I noticed in THE AUTOMOBILE that on the trial or test of the six-cylinder Packard motor the water entered at 125 degrees Fahrenheit and came out at 145 degrees Fahrenheit.

1—Is not the excessive heat I mention an injury?

2—Does it cause excessive consumption of fuel?

3—What is the ordinary number of miles per gallon of gasoline in such a car as mine, say at 12 miles per hour on ordinary country roads?

4—Are rotary circulating pumps in automobiles liable to get out of order and fail to do their work?

Interlachen, Fla. J. W.

—From your letter it would seem that you were in the habit of traveling with a rich mixture and a retarded spark and that the trouble is in this rather than in any inherent wrong in the car itself. A retarded spark causes the motor to overheat very rapidly and thus will give rise to boiling cooling water. When a retarded spark is coupled with an over-rich mixture the result of the combination of the slow-burning charge with the lateness of the spark makes the motor still hotter. Try adjusting your carbureter to give a little more air and when running advance the spark as far as you can without getting a knock. If the motor tends to speed up too much when you advance the spark, cut down on the throttle. In other words, do not attempt to govern the speed of the motor by the spark, but arrange the spark to suit the needs of the throttle. That is, advance the spark under any circumstances to the maximum possible point and then keep it there until a change in the motor speed necessitates a change in the location of the spark lever. It would be wise for you to clean out the radiator on the possibility that there is an accumulation of sediment therein which prevents it from cooling the water. To perform the cleaning operation, two or three handfuls of soda are dissolved in a pail of boiling water and this solution poured into the previously emptied radiator. Run the motor for a minute or two and then drain out. Repeat this performance about three times, and then another three times with pure clean water until you get the water coming out fairly clear with very little white matter.

The temperature of the water in the Packard test at the Automobile Club of America was as you state. It must be remembered, however, that this was a block test and cannot, therefore, be considered a parallel to road conditions. Cooling water on the road will average in temperature between 180 and 190 degrees Fahrenheit with a correctly-designed and sized radiator.

Another point you must look for when a motor that seems to be in good condition overheats is the fan belt, which may be slipping. The fan bearing bushing sometimes becomes jammed and as a result the fan is so difficult to revolve that the belt just slips around without turning the fan.

Regarding the numbered questions:

1—The heat is dangerous in that the lubricant is working at such a disadvantage that it cannot perform its work properly and some of the bearings or the pistons themselves are likely to seize.

2—The high working temperature does not cause a greater consumption of fuel in itself, although it may be partially due to the admission of too much fuel through the use of a rich mixture. That is, the heat will not cause the use of too much fuel, but too much fuel may cause the heat.

3—Your car is not working at its best economy at 12 miles an hour as far as fuel is concerned, although as far as the rest of the car may be considered it is. That is, although you may not secure so many miles to the gallon of gasoline you will find the wear and tear on your car to be much less. At 12 miles an hour on high gear you should get about 14 miles to the gallon of gasoline.

4—Trouble with rotary or centrifugal pumps as used in automobile work is so scarce that it need hardly be considered. When cooling trouble develops, though, the pump should be examined as well as any other points in the cooling system. Sometimes a leaky hose connection or one which has a loose piece of fabric in the interior is responsible for overheating.

Explanation of Argyll Motor Wanted

Editor THE AUTOMOBILE:—Kindly let me know whether the Argyll engine has a rotary sleeve or not. In the description of the engine that appeared in THE AUTOMOBILE some time ago it was stated that the sleeve was operated by a worm mechanism and the motion was constant, but was somewhat vague as to how the ports were opened and closed.

Yonkers, N. Y. R. A. FINES.

—The Argyll motor was depicted in THE AUTOMOBILE for June 12, and also described. As the motor is important, however, the repetition may be valuable and is herewith reproduced from the previous issue. Fig. 3 shows a transverse section in which the sleeve S will be noted, occupying the annular space between the piston and the cylinder wall. Its action is peculiar in that the motion imparted to it is not merely up and down but is also partly rotational. This will be made clear by reference to

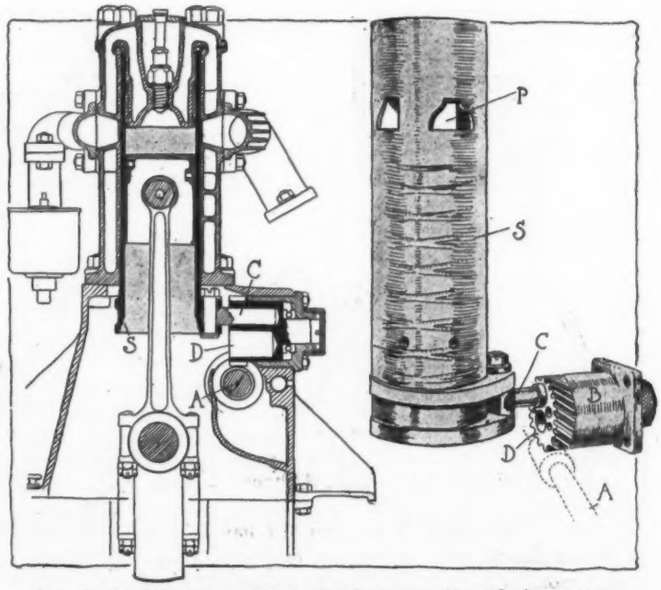


Fig. 3—Argyll sleeve motor, showing operation of sleeve valve

Fig. 3, which shows the sleeve and its operating mechanism detached from the engine. The reciprocation of the sleeve is effected by the action of a small crank C which has a sliding fit in the rotating member D. This latter is carried in the bearing B, which is bolted to the crank casing wall. The operating shaft A, which is equivalent to and occupies the same position as the camshaft in the poppet-valve type of engine, is provided with four worms or skew gears, one at each cylinder, which engage with teeth on the rotating member D, driving it at half the speed of the crankshaft. This reduction takes place at the skew gearing, the camshaft itself running at the same speed as the engine shaft by silent chain.

Two revolutions of the engine shaft, therefore, cause a single revolution of the actuating crank C, which in turn imparts such a motion to the sleeve that any one point on its outer surface will have traveled through an elliptical path on the cylinder wall.

This peculiar motion is the fundamental principle of the Argyll valve. It permits a complete register of opening of the valve port P with the corresponding ports in the cylinder wall while the sleeve is traveling in one direction and a complete closing on the opposite stroke. As the sleeve descends, exhaust is opened and during the return stroke the inlet ports open. This cannot be accomplished by a single up and down stroke of a sleeve with the ordinary straight reciprocating motion, where both valves would necessarily be opened twice.

Using Buggyaut for Stationary Work

Editor THE AUTOMOBILE:—Your reply to Mr. Mathais regarding the best way to utilize a car for power has been noted. If Mr. M. can apply his belt to the flywheel of the engine he will save the needless wearing out of his transmission, propeller shaft, differential and rear-axle bearings. The Service truck you show has a pulley at the rear end, but the Avery truck is equipped with one on the crankshaft at the front end of the vehicle.

Fig. 2 gives an illustration that may interest you, showing a Buggyaut having one wheel removed and a pulley substituted on the end of the crankshaft for the driving roller. This gets power directly from the engine, and the change can be made in 5 to 8 minutes. This is being used not only for shelling corn, as shown, and chopping feed, but for sawing wood and similar purposes where a small power suffices. In the Duryea system it is, of course, understood that the motor lies at the rear of the vehicle with its shaft crosswise, so, although this pulley protrudes from the side, it is actually on the motor shaft directly, just as in the Avery truck mentioned.

Your reply to C. G. F. as to the spelling of "carburetor" is all right, but a good authority like Webster gives preference to the ending "or," and this coincides with many words used in the industry, such as compressor, generator, conveyor, lubricator, distributor, motor and ignitor. It seems, therefore, good business to use a similar ending in this entire "bunch." In fact, if we could as a nation agree that the ending "or" means the "thing which," while the ending "er" means the "one who," it would better our language materially.

Saginaw, Mich. CHAS. E. DURYEA.

Chokes When First Starting

Editor THE AUTOMOBILE:—As I was about to start out this morning at 6 o'clock with my White gasoline "30" I found I could not give the motor much gas on the accelerator without its choking. It started without any trouble, but refused to take the accelerator until I had it running about a minute, after which it worked well. It was rather cool this morning and since it was the first occasion I had to use it that early in the morning, I blame the cool air for the trouble. Although the car is used only about once a week I find it chokes for about a second each time it is started and then it is all right. I have the water turned off around the carbureter because I only use the car during the summer months. I now have the adjustment screw at the lower side of the carbureter turned down or closed because when I

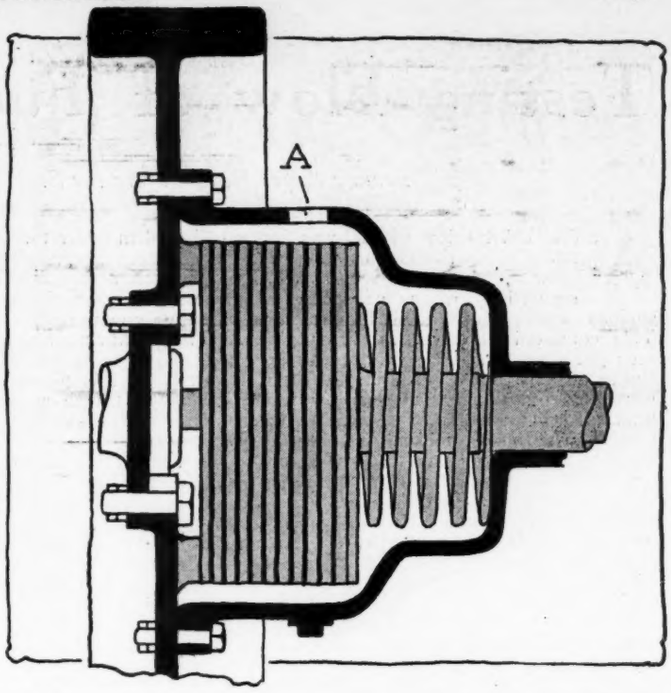


Fig. 4—Clutch should be cleaned by introducing kerosene through A

open it any more the motor becomes very slow in picking up.

1—Could you please tell me if the adjustment should be opened and how many notches for good results in summer?

2—What is the small nut near the top of the carbureter marked X there for?

3—Is it necessary to put oil in the crankcase when oil runs freely from the oil level, which is visible by pulling out a rod from the front, beneath the radiator leading to the crankcase?

Richmond Hill, L. I. P. B.

—Bad gasoline, or rather gasoline which is not so volatile as that sold some time ago can be blamed for much of the trouble of this nature that now exists. The gasoline will not vaporize without the application of heat at a sufficiently rapid rate to permit of securing a good homogenous mixture in the cylinders. It is sometimes possible to cure the trouble by admitting a little more air at low speeds, but you stand that chance of having a motor which is harder to start. If the carbureter acts well after the motor has been running a few minutes and pulls well on the hills it would be very advisable to let it alone and to blame the gasoline and not the carbureter. The only real cure for a condition of this kind where it is not desired to have the choking action at all is a dash air control whereby more or less air can be admitted at the will of the operator. To answer your questions specifically:

1—On the average White car, the best results are obtained when this screw, which is the air adjustment, is backed off about twelve or fourteen notches. The screw is first closed down as far as it will go and then the adjustment is made by turning back on it for the distance mentioned.

2—The nut you speak of is one of the hot water cannections.

3—No, as long as oil runs from the level when you pull on the rod it shows that there is enough oil in the crankcase. This is merely a safety level.

Please Sign Your Inquiries

The Editor of the Rostrum is in receipt of several letters which offer no clue to the identity of the sender because they are signed Subscriber, Reader, by initials or noms de plume. These letters are held and will be published as soon as the senders identify them. If your letter is among these you can have it published by writing this office describing the letter and giving your name and address. If you desire that your name be not published just mention this in your letter.

Testing Flow of Fuel Through Nozzles

From a Paper Read Before the S. A. E. and I. A. E. by R. M. Anderson.

A STANDARD flow of fuel was first established in order to make comparisons and judge of the accuracy of such laws as have been set forth. The standard flow was secured by means of special apparatus wherewith the various heads could be easily duplicated and accurately measured. This consisted of a vertical brass pipe A, Fig. 2, having an area 500 times the area of nozzle to be tested and of sufficient length to give any desired head. Into the walls of this pipe were soldered thin-walled overflow tubes .3 inch by 1 inch at intervals of 3 inches. These tubes were inclined at a slight angle. The nozzle-holding member B, Fig. 2, consisting of shutoff cock, elbow and drain basin, was so located as to bring the tip of the vertical nozzle 1.25 inches from level of gasoline as determined by outlet tube No. 1. Gasoline was supplied by electrically driven pump C, Fig. 1, keeping a quantity of fuel in tank D. From D the quantity was regulated by valve D1 and flowed into open end of pipe A. Some difficulty was experienced with large flows disturbing level A until the supply from D was slightly damped.

In operation the procedure was as follows: All overflow tubes were plugged except the one corresponding to the head desired. Gasoline was turned on at D1 and at the nozzle until a steady even flow was secured through the overflow tube in operation. This surplus was returned to the pump tank. The gasoline draining from the nozzle-holding member B in a unit of time will be the quantity flowing at the head taken.

To get accurate readings the following precautions were observed:

(1) Gasoline kept at uniform temperature, 60 degrees to 62 degrees Fahrenheit.
(2) Specific gravity of the same, 54 degrees Baumé.
(3) Pump started and run a sufficient length of time to insure uniform flow.
(4) After each reading the nozzle was carefully cleaned. The flows at maximum and minimum heads were checked after the test was finished to make sure the area had not changed.
(5) All readings taken by the same person.
(6) A standard primary nozzle was used and checked with standard gage before commencing test.
(7) All quantities of gasoline measured by the same graduate reading, CM^3.

The purpose of the experiments is to determine from a carefully calibrated nozzle the relation of flow to head. Such data will at least give us a better understanding of the flow of gasoline in carbureters and consequently their adjustment. The heads were maintained as outlined and every opportunity was given for the flow to assume characteristic variations. It has been known that at relatively low heads the flow of fuel is subject to slight diminution. The quantities flowing at the various heads represent faithfully an average performance.

The following quantities of fuel and their respective heads are taken as the average of five readings:

Nozzle, No. 57. Diameter, .043 inch. Area, .0014502 square inch. Gasoline, 54 degrees Baumé at 60 degrees Fahrenheit.

TABLE 1.

Reading	H = Head Ins.	Q = Quantity per min. CM^3	Q = Quantity per min. Cu. Ins.	Q^2 Cu. Ins.	$Q^2 + Q$	Differences
1.	1.25	27.30	1.67	2.78	4.45	
						11.85
2.	4.25	50.50	3.69	13.61	17.30	
						12.26
3.	7.25	81.47	4.96	24.60	29.56	
						12.96
4.	10.25	99.00	6.04	36.48	42.52	
						13.33
5.	13.25	114.50	6.99	48.86	55.85	
						12.12
6.	16.25	127.00	7.76	60.21	67.97	
						12.06
7.	19.25	138.50	8.46	71.57	80.03	
						12.65
8.	22.25	149.60	9.14	83.54	92.68	
						13.36
9.	25.25	160.50	9.81	96.23	106.04	
						14.49
10.	28.25	171.80	10.49	110.04	120.53	
						11.93
11.	31.25	180.50	11.02	121.44	132.46	
						14.18
12.	34.25	190.25	11.62	135.02	146.64	
						11.61
13.	37.25	198.00	12.09	146.16	158.25	

In Fig. 3 the above values of Table 1 are plotted. Q, as might be anticipated, takes the parabolic form. Applying this value in the general formula

$$Q = C A \sqrt{2gh}$$

and solving for C, gives the following:

TABLE 2

H	C	H	C
1.25	.614	13.25	.794
4.25	.750	.....	....
7.25	.766	22.25	.803
10.25	.779	37.25	.822

The above brings out the erratic flow at small with respect to large heads. Any attempt to proportion Q to $\sqrt{h}$ would introduce a variable difficult of determination. This curve is, however, plotted as $Q^2 = H$ and plainly shows its characteristic, viz., a fairly straight line when H is greater than 7 inches.

Realizing this characteristic, Lauret has applied Rummell's water experiments with interesting results. Here the simple addition to Q^2 of the quantity Q gives values more nearly approaching the straight line. In Table 1 these values and their differences are given. The average difference 12.70 cubic inches may be taken as the increment for a No. 57 nozzle where the change in head is 3 inches. Thus

$$\frac{Q^2 + Q}{4.23} = H$$

may be taken as the expression characteristic of the flow of fuel through small orifices with large variations in head.

In general this may be expressed

$$\frac{Q^2 + Q}{C} = H$$

where C is the constant changing for the various diameters of nozzles. Thus with this formula it is only necessary to determine the value of C at maximum head, since this fixes the angle of the slope for the remaining values.

It is necessary, however, to correct the lower values of Q at small heads, since the surface tension under these conditions is quite effective in holding the fuel back. Thus if

$$(Q^2 + Q) = y$$
$$C = A$$
$$H = x$$

we may write the expression taking B, the effect of surface tension from actual tests, as:

$$y = A x - B$$

Solving for B when $y = 4.45$, $x = 1.25$; $A = 4.23$, $B = .8375$

Thus B and A determine the characteristic of the flow of fuel rough such a nozzle as shown in Fig. 1.

When, therefore, these two constants have been determined and the quantity per minute is given, it is simple to solve for H.

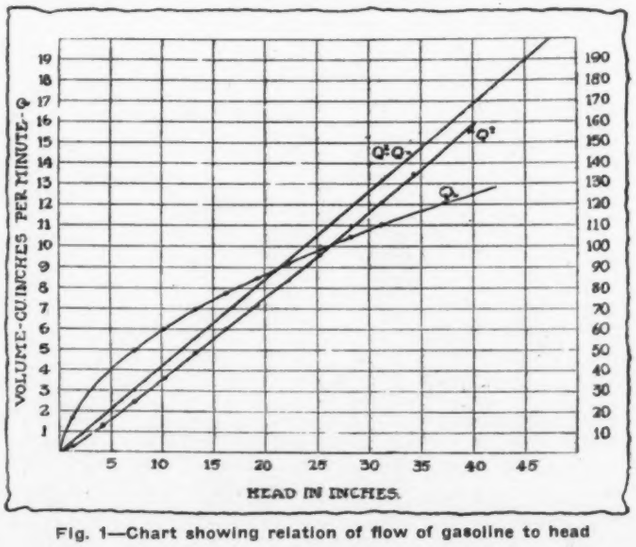


Fig. 1—Chart showing relation of flow of gasoline to head

The Superiority of the Steam Omnibus

From a Paper Read Before the S. A. E. and I. A. E. by Thomas Clarkson.

IN order to avoid misconception with respect to my attitude toward the internal combustion motor using spirit fuel, permit me at the outset to state that I fully appreciate the enormous utility of this type of motor in certain departments of automobilism—that my strictures upon it as applied to bus work should not be regarded as the outcome of a prejudiced judgment but rather as an impartial scientific analysis of the special conditions applicable to bus work and heavier automobilism. This to the end that other fuels besides spirit should be utilized such as kerosene, crude oil, coal or coke, thereby easing the demands upon the spirit motor and its fuel supply, and leaving it greater freedom of development along its special lines of utility.

Passenger Transport Facilities

Increased facilities for passenger transport in cities are constantly in demand. Transport by electric rail motors, both on the surface and underground, has, to some extent, met this demand. But the automobile public service car, or as it is generally called, the motor bus, has already demonstrated its superiority over the rail car or tram.

The main points in favor of the bus over the rail car are its flexibility and independence of action. Flexibility is the dominant feature, flexibility of route, both as to deviations, extensions and modifications according to traffic conditions, and also flexibility of control in traffic, especially rapid flexibility of speed so as to accelerate promptly in response to traffic conditions whether congested or otherwise.

Complete flexibility is obviously impossible so long as the motors are dependent upon an extraneous power station. The vehicles must be self-contained and the power generated from within. Flexibility I regard as the keystone to the successful solution of the street traffic problem in cities, and I submit that the type of motor which gives most flexibility with the least trouble and expense is the type which will make good. Hence my preference for the steam motor bus in its present perfected form.

A properly constructed steam motor possesses a reserve of energy which is immediately available for a spurt, and acceleration can be speeded up smoothly and without jerk or inconvenience to the passengers.

The control by the driver of a steam motor is simplified and the demands upon his energy and nerve force are reduced to a minimum. This last has an important bearing upon the prevention of accidents and loss of life. The speed is entirely controlled by a foot throttle and no change gears are used.

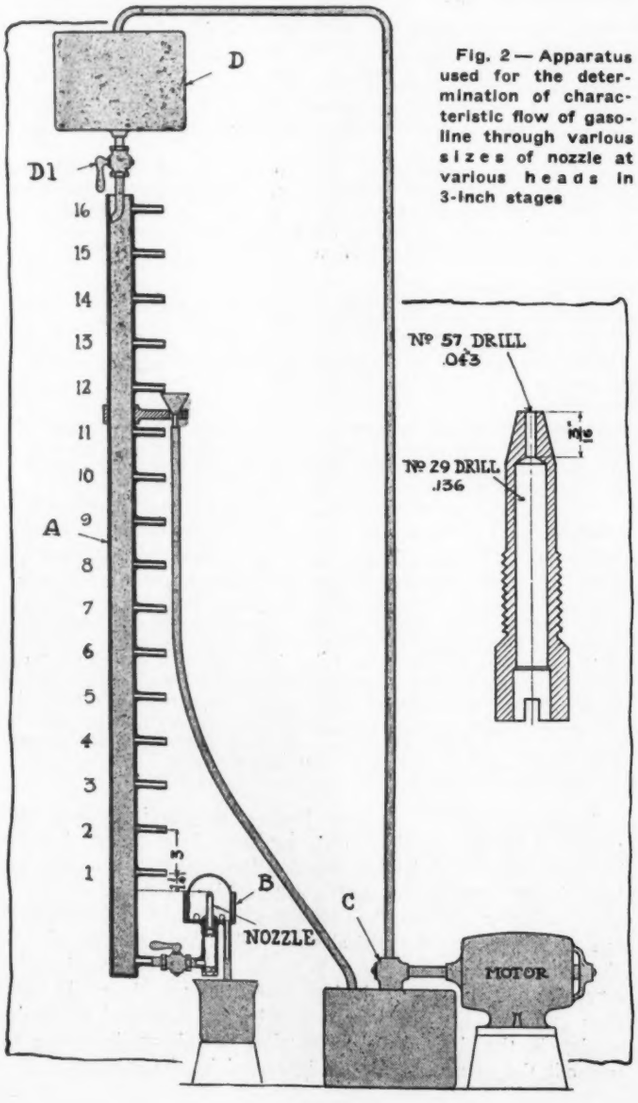


Fig. 2—Apparatus used for the determination of characteristic flow of gasoline through various sizes of nozzle at various heads in 3-inch stages

Reduction of Weight

The weight of a fully laden standard London bus is 13,440 pounds. The unladen weight is 7,840 pounds. This is about 2,000 pounds less than the former weights of both internal combustion and steam buses of the same carrying capacity (thirty-four passengers) which were common a few years ago. This substantial reduction in weight has vastly improved the breed of the bus, for which thanks are due to the police authorities for insisting upon a lighter construction in order to obviate damage to adjacent properties consequent upon severe road vibrations. It was prophesied that this police demand would rule out the steam bus as it did the storage battery electric bus. But it is significant that the first bus to be licensed under the new régime as to weight was a steam bus, a No. 5 National. This was nearly 4 years ago. I claim that the steam bus is still the best, the most efficient and popular, and this view is shared by some of the leading traffic men who control internal combustion motor buses. It is noteworthy that every one of the companies running internal combustion buses in London have been unable to stand the competion of their largest petrol omnibus rival, and have all been absorbed. Today the only omnibus company able to maintain its independence of the great omnibus combine in London is the company running steam omnibuses. The advent of the motor omnibus appears to sound the death knell of the street rail car. The public shows a decided preference for the motor bus and the reason is not far to seek. The bus, owing to its greater freedom and flexibility of action, is easily able to beat the rail car in carrying passengers to their destination in the shortest possible time. Another advantage of the bus is that it can pick up and set down at the edge of a sidewalk instead of requiring passengers to walk in the roadway to or from the car. As a rival to the street rail car the motor omnibus has become a very serious proposition, and the perfected motor omnibus should be of immense value in solving the street traffic problem of cities. The presence of rails in the surface of a common road all automobilists will agree is detrimental to the efficiency of the road surface, and to the vehicles using the road.

The following summarized description will explain the leading points of the National steam bus:

The fuel is kerosene which is vaporized, mixed with air and burned beneath a water-tube generator. The generator is entirely of steel and works at a pressure of 300 pounds (test pressure 1,000 pounds). It is inclosed in a vertical cylindrical case under the bonnet of the chassis, and has a central drum which is closed at the lower end, and fitted at the upper end with a lid for cleaning. This drum is furnished outside with generating tubes of horseshoe form which permit free expansion without strain.

The steam is manufactured in four successive stages:

(a) A preliminary heating of the water to about 140 degrees.

(b) A secondary heating of the water under pressure to about 400 degrees.

(c) Conversion of the heated water into steam at 300 pounds pressure.

(d) Superheating of the steam to about 800 degrees.

The steam is utilized in a simple two-cylinder double-acting reversible engine which drives the rear wheels of the chassis direct through worm gearing at a ratio of about 7 to 1. There is no clutch and no change gears.

The exhaust steam is condensed, filtered and returned to the tank for further use.

The fuel consumption is regulated automatically by steam pressure. The success of the National steam buses is doubtless due in great measure to the excellent "fool proof" generator.

Time does not permit me to refer to the spring, steering, axle construction or brakes of the chassis which are upon standard lines, but there is one detail of the construction of this bus which calls for special notice, *i.e.*, the wheel.

The life of a motor bus is extremely strenuous, probably the most strenuous of any automobile. Its annual mileage is about 30,000. Most of this is done on roads teeming with other traffic; consequently a bus has to stand hard knocks and rough usage. Wooden artillery wheels have proved unequal to the duty. Wheels constructed of cast steel have proved troublesome and uncertain. The National bus road wheel is constructed entirely of forged steel. The spokes are solid drawn tubes welded to a hub which is machined out of a solid forging. The outer ends of the spokes are welded to flanges which are afterwards machined before the rim is shrunk on. The perfect balance of this wheel and the reduction of about 170 pounds in the weight of the four wheels of a bus have materially reduced the wear on tires, and the absence of any internal stresses in the wheel is a great factor in reliability and public safety.

Illumination of the Bus

The proper lighting of a bus has been a troublesome problem, neither oil nor acetylene having proved satisfactory. Electric illumination gives best results. The problem has been to devise suitable electric equipment. This problem has been solved on the steam bus in a very simple and satisfactory manner. About 10 years ago I experimented with electric light for bus illumination. The first equipment was worked from a storage battery, but it did not pan out and electric lighting was discarded. Subsequently a scheme was devised whereby a small storage battery was used in combination with a special dynamo driven by the car and with cutouts similar to lighting systems now used on some pleasure cars. After running this combination in service for several years I abandoned it in favor of a dynamo of the ordinary type directly attached to a small steam motor and without batteries or cutouts. This steam motor runs at a constant speed of 900 revolutions per minute, and the equipment provides current for 150 candlepower per bus. The arrangement has proved completely satisfactory. The cost and weight of the installation have been reduced as well as the cost of maintenance; at the same time greater brilliancy of illumination has been secured. Excellence of illumination has proved a strong point in popularizing the steam bus and in helping traffic receipts.

Some steam buses of the earlier type have been in regular service for the past 10 years and are still running. But the steam bus of today has been evolved during the past 2 or 3 years since the designer and manufacturer took up the business of running buses and maintaining them.

In the short time available for this paper it is impossible to give a history of the evolution of the modern steam bus upon which I have been engaged for nearly 20 years, and as the main object of this paper is to promote a discussion on the relative merits of steam and internal combustion buses, I will briefly summarize a comparison between these two types of motor.

Summary of Costs

The First Cost of the bus appears to be about equal for the same quality of material and workmanship and with a similar rate of production.

Cost of Maintenance—It has so far been impossible to obtain figures which are strictly comparable as to the relative maintenance costs of the two systems. The only way to obtain them would be for the same auditor to examine and analyze the books of both a steam bus and an internal combustion bus company, and to treat both in precisely the same manner as to depreciation, annual overhaul, establishment expenses, etc. Experience shows that the steam bus is in the garage for maintenance a much shorter time than its rival. It is the practice to withdraw an internal combustion bus from service 1 whole day in 10 for maintenance, apart from the withdrawal from service for annual overhaul, which usually takes about 2 weeks. On an average during the year the internal combustion bus loses more than 15 per cent. of its total possible mileage. Total possible mileage means every bus that is licensed doing every journey every day for 7 days a week throughout the year. During the year ended October 31, 1912, the National steam buses lost only 2.847 per cent. of the total possible mileage, and of this only .877 per cent. was due to mechanical failure. That it has been possible to run steam buses under the extremely strenuous conditions prevailing in London so as to give over 97 per cent. of their total possible mileage, whereas the internal combustion bus is not able to do 85 per cent., speaks eloquently both for the superior reliability of the steam bus and its cheaper maintenance.

Points of Superiority

Tires—There is less wear on tires with the steam bus owing to the smooth drive.

Rapid and Smooth Acceleration—In this respect the steam bus is easily demonstrated a winner. The extra steam pressure which accumulates at each stop gives an extra "push off" at re-starting.

Flexibility and Speed—In this respect also a superiority of the steam bus is demonstrated daily.

Illumination—The steam bus is admittedly the most perfectly illuminated.

Popularity—The public shows decided preference for the steam bus.

Vibration and Jerk—There is less vibration on the steam bus. The engine does not run when the bus is stationary for picking up or setting down passengers, and there is no uncomfortable jerk at starting.

Depreciation—Steam buses which I started in regular public service over 9 years ago are still running. I cannot find any internal combustion buses which have been in service so long. My rule for estimating depreciation is to give a 6 years' life, and at each annual overhaul to bring the bus right up to date.

Fuel—A steam bus uses kerosene fuel and so helps to relieve the pressure on the spirit market. With equality of ratio between

$$\frac{\text{price of kerosene}}{\text{price of spirit}} \quad \text{and} \quad \frac{\text{mileage on kerosene}}{\text{mileage on spirit}}$$

there is nothing to choose between either type in cost of fuel. The great increase in the demand for spirit and the absence of a like increase in the demand for kerosene favors the kerosene-fired steam bus.

Drivers prefer the steam bus on account of less fatigue in operation and greater certainty of completing the journeys.

I will conclude the summary by giving the actual figures for lost mileage from all causes during the year ended October 31, 1912, for the fleet of National steam buses in London.

	Per cent.
Buses withdrawn from service for annual overhaul	1.844
Buses withdrawn from service for passing drivers	.045
Buses withdrawn from service for police stops	.023
Buses withdrawn from service as a result of accidents	.058
Buses withdrawn from service in consequence of mechanical failure	.877
Total, from all causes	2.847

I think it will be agreed that these figures are remarkable, especially in view of the fact that the loss of service due to mechanical failure was well under 1 per cent., having regard to the exceptionally severe conditions of the service.

Final Note

It must be obvious that a steam motor which gives such results, under the abnormally severe conditions of public omnibus service, should have useful work to do in other departments of commercial automobilism, say for net loads of 3 tons and over. And it is important to note that for this work the steam motor can use coal or even coke fuel. In this manner a large section of commercial automobilism can be placed right outside the range of the oil trusts which now dominate the fuel supply, and commercial transport of first-class reliability can thus be supplied at a lower working cost than is possible under present conditions with the internal combustion motor.

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AUTOMBILE SHAFTS SELDOM FAIL—Although it seldom happens that automobile shafts fail, yet cases have occurred under circumstances which lead to the conclusion that the failure has been due to running the shaft at the critical speed of speeds so close to it that vibration has been the cause. As an instance, in one case of failure the critical speed calculated from the dimensions of the shaft was 1,030 r. p. m. The shaft speed under service conditions was limited to 1,000 r. p. m. As might have been expected, had the critical speed been calculated when designing it, the shaft failed in service, though amply strong to transmit the maximum torque developed by the engine.

Trucks in British P. O.

Motor-Driven Vehicles Will Have Superseded Horses in United Kingdom in 3 Years

By Charles Wheeler, Controller of Stores Office, G. P. O., London.

IN 3 years we will have no more horses in the service of the postoffice of Great Britain. At the end of that time the service will be divided among motor trucks, motorcycles, tricycles and bicycles.

There is not a house in the British Isles to which mail is not delivered at the door. Like a large spider web with its center in London the postal service covers the entire country and includes every habitable spot.

To get an idea of the postoffice organization in Great Britain it may be stated that the mail is carried by rail or motor truck from one large postal center to another. Next in order are the smaller wagons which are now to a large extent drawn by horses. Below these are the carrier bicycles and tricycles. The mail is carried by contract, the contracts being let by the government.

The contracts run for periods of 3 years. At the end of this time they are renewable if the service has been satisfactory or if no cheaper method of carrying the mail has been discovered. The postoffice has found that one motor truck will replace three horses and still be more economical and hence those now holding contracts for mail carrying will find that when it comes time for renewal the government will not accept bids on any but motor service.

Now Have 1,000 Trucks in Service

There are now 1,000 motor trucks in the British postal service. These have proved their economy and money-saving talents very extensively on inter-city parcels post service. A concrete example of this is the run between London and Birmingham. This is a run of close to 100 miles and is now being made by motor trucks instead of by rail. The amount of money saved can be realized when it is understood that the railroads get a little more than one-half the face value of the postage, regardless of the distance the matter is carried. On a load of 1,000 pounds with an average charge of 12 cents per pound, the face value of the load would be $120 and of this the railroads would get more than $60 according to the contract with the government. This $60 would go a long ways into the expenses of the run by motor truck.

One of the great advantages of the motor truck is its ability to drop the mail not only at the door of the terminal postoffice of its destination, but to do the same all along the run. Each intermediate postoffice is served at its door and thus all sub-terminal charges are saved. There is no expense connected with bringing the mail from the railroad station to the postoffice in addition to the regular inter-postoffice carrying charge.

All through the interior of the country there are many small towns that have their postoffices some distance from the nearest railroad station. In the past these postoffices have had their mail brought to the station or dropped off the train and then an independent concern has carried the mail over to the postoffice. This adds an appreciable amount to the large percentage collected by the railroads.

In England the direct competition of the motor trucks with the railroads on runs up to 100 miles has now reached such a condition that the railroads will either have to come down in their charges or they will find that the shorter runs will all be taken up by the automobiles.

On the 100-mile run, say such a run as that between London and Birmingham, the London driver goes 50 miles, meets the truck from Birmingham and then drives it back to London. In this way each driver goes 100 miles, the length of the entire run, but is able to sleep at his home every evening.

The automobiles which are in service have been adopted only after a rigorous test. The test for the British postal service extends over a period of 12 months. Every 3 months the data collected are carefully checked up and the results analyzed to determine if the article tested is coming up to requirements. If not it is rejected at once. At the end of a year the whole test is carefully gone over and the figures and costs calculated out to a farthing. If satisfactory the article is accepted as standard. The laboratory test, though extensive, is not relied upon except as a check to the road test. The motor trucks which are now in service are the Wolseley, Dennis, Alldays, Maudsley, etc.

In making the tests the users of the motor truck, motorcycle or whatever it may be, are not informed that it is out on test. It is merely served out to the driver and he uses it as he would any other new piece of equipment. The department, however, keeps a keen eye on these new vehicles or accessories and the drivers' troubles as well as defects in construction are noted. In the motor truck the greatest trouble which has developed, and one which we are still wrestling with, is the tire question. The main trouble with these is the fact that they leave the iron felloes. The postoffice, after exhaustive tests, has abandoned the clincher type of tire and taken up the band type. Only solid tires are used in the service.

One point which has already been learned from experience in the test work is the necessity of over-tiring. Even beyond the limits laid down by the manufacturers the department believes that it is true economy to add extra weight to the tire.

Under test at the present time scattered about different parts of the kingdom are a score of motorcycles. These are reported favorably thus far and will no doubt become a fixed part of the equipment before long. The motorcycles will do the work of the smaller trucks and will be fitted with side cars having a large carrying capacity. These motorcycles are fast and will perform the work in the rural districts to great advantage as far as both the parcels post and the regular post are concerned. A very interesting point regarding the tests carried on by the department is the attention given to new inventions. Every inventor is sure of a fair hearing and scarcely a day passes but someone is not suggesting some time or labor-saving device. These are first passed on in the office and if they seem reasonable are sent out for the 12-month road test.

A most elaborate bicycle service is used for distributing local mail. The aggregate annual bicycle mileage in the postoffice service in the British Isles exceeds 150,000,000. This is attended to by 16,000 bicycles with 50-pound capacity baskets. To give an idea of the efficient service rendered by these an example may be given. We have in the service a bicycle which has covered 160,000 miles and still has the original frame, handlebars, etc. The bicycle tires are 28 by 1.375 inches and are of the double-tube clincher type. The average bicycle tire will give 15,000 miles service.

U. S. Post Office Buys Alcos

Representing an investment of $225,000, one of the largest truck purchases on record has been effected by the Alco company for the purpose of carrying mail in the city of New York. Eighty 3.5-ton trucks were purchased.

The battery of vehicles will have a capacity of 4,300 tons of mail in a day, which means an annual capacity for carrying 1,550,000 tons or 3,100,000,000 pounds. In terms of volume hauled, the array of machines on each trip can transfer 24,000 cubic feet of mail. Figuring on the basis of 18 trips which will be required in a day, the total daily capacity is 432,000 cubic feet of mail, and the annual capacity is 157,680,000 cubic feet.

It is estimated that the trucks will cover a mileage of 1,000,000 miles in a year. The average haul is two miles so that the annual total number of trips will mount to 500,000.

Lined up, one against the other, the 80 trucks will reach a distance of 1,310 feet, or approximately a quarter of a mile.

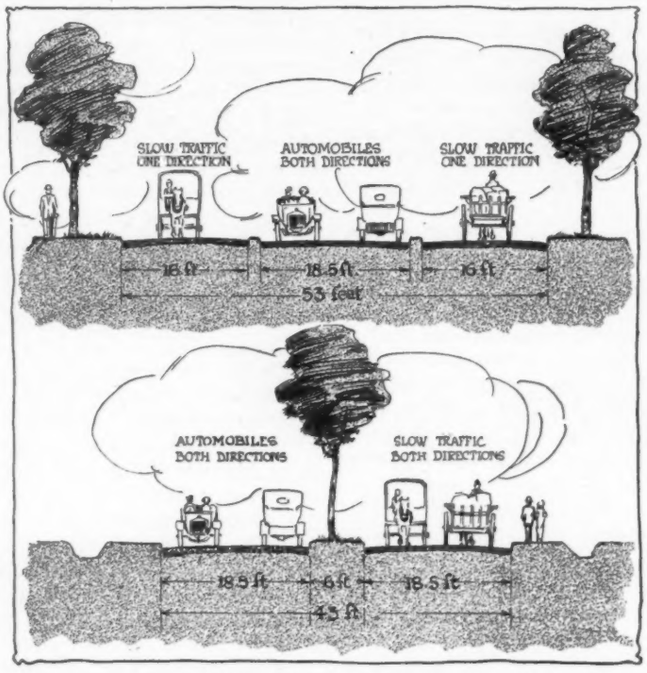
The fleet of trucks was purchased by the Postal Transfer Service, Inc., which has the government contract for carrying U. S. mail in New York.

Special Tracks for Different Vehicles

Suggested schemes to relieve traffic congestion and reduce road dangers

IT is not generally realized how enormous is the loss incurred every year in and about large cities by the congestion of road traffic. Even the cost of living, so much in the air at the present time, is becoming increasingly dependent upon the cheap and easy transport of merchandise.

Before the automobile made its appearance the speeds of the various vehicles using the roads were sufficiently near to each other to render traffic blocks of almost negligible frequency. Nowadays, however, not only has the total number of vehicles in city and suburban roads increased tremendously but there is in addition the aggravating factor of delay caused through the greater differences of speed between the slow and the fast sections of traffic. The higher speed capabilities of the self-propelled vehicle has had the effect of increasing congestion by producing a less regular flow of traffic. This is not entirely the fault of the automobile. It can be more correctly attributed to the fact that there still is, and must ever be present, a considerable proportion of really slow vehicles, making it necessary for the faster ones, in the narrower roads at least, to waste a great deal of time in waiting for opportunities to pass.



Dimensioned cross-sections of roads, showing alternative methods of distributing fast and slow traffic

Since it is the various speeds which apparently produces the undesirable feature of congestion it would appear that a remedy must lie in the establishment of separate roads or tracks for each class of vehicle.

This brings in the questions of increased expense of construction and upkeep, availability of land of the necessary width, and finally, granted these requirements, there is the question of classification, this latter not being the simple matter it might seem at first sight. There are, for instance the passenger automobile which maintains a fairly steady fast speed, and the horse-drawn delivery wagon which travels slowly and makes frequent stops. This would suggest two broad divisions of traffic.

But there are also light fast horse-drawn vehicles of the pleasure type and automobile delivery wagons, the latter stopping frequently along roads bordered by houses. Each of these classes, if the traffic divisions were simply automobile and horse-drawn vehicles, could more suitably be classed with the other division.

To come to practical application of the special track principle a good example is the Avenue des Champs-Elysees in Paris. The arrangement here is shown in the upper illustration on this page. A center track 18.5 feet wide is reserved solely for the use of automobiles traveling in either direction. On each side is a slightly narrower track 16 feet in width for slower traffic, each direction keeping to its own side. Such a road requires a minimum total width of 53 feet, but where this is available no better arrangement could be adopted. The positive raised divisions would, of course, be broken at every crossing and at additional points also, in a residential district where there are few cross roads. It is extremely difficult to say whether a plain road of the same total width, if the same rule regarding divisions were strictly observed, would not be almost as convenient, as it would permit a momentary overlapping in exceptional circumstances. But the human element is then introduced and the careless driver would have a more serious effect on the safety of other road users.

Two other arrangments suggest themselves. That of dividing the road width into two as shown in the lower cross section, and reserving each side for one direction of all kinds of vehicle, or, alternatively, confining one track to automobiles and the other to slow vehicles. A good example of the first of these alternatives is seen in the northern sections of Broadway, New York, and where the road is bordered by houses on both sides this is certainly the better system as it requires less crossing over of vehicles making stops at the houses. If the road runs alongside a railway or river, however, the disposition of traffic shown in the illustration would perhaps prove more convenient, reserving the side next the river for automobiles, since a large proportion of these vehicles are out for plasure and need seldom stop.

A point of some importance brought out by the division of the road into special classes is that of simplifying the problems of the road engineer. It is well known that one of the greatest obstacles to the correct construction of roads has been the necessity of providing a surface that would be suitable alike to the fast rubber tired vehicle and the iron shod hoofs and iron tired wheels of the horse drawn. By confining each class to a special track the surface can be made to suit the requirements of that class.

With the advent of the automobile the old type of water bound macadam road was found inadequate owing to the dust. The dust had always been present, the pounding of the horse being in a large measure responsible, but the rubber tire of the automobile raised it to the standing of a nuisance.

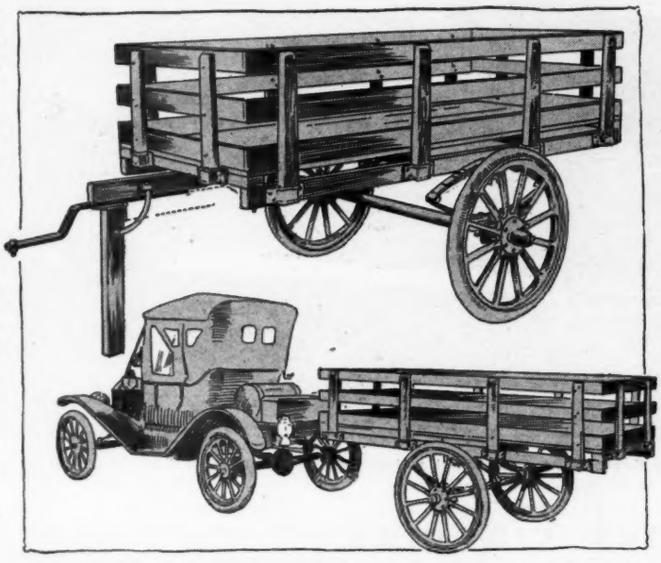
During the past decade efforts have been made to reduce dust by the application of various sprinking mediums, oil being the most successful. But it was soon found that the real solution lay in the entire construction of the road. This has brought about the bituminous road which is more nearly perfect with regard to dust prevention than any previous constructions.

In this type of road, which is growing rapidly in favor, the various layers composing it are bound into a solid mass by the application of a tar or oil-asphalt preparation.

Delivery Trailer for Passenger Cars

Two-wheeled attachment affords facilities for light delivery at small cost

WHILE the passenger automobile is not looked upon as a delivery car, it may be temporarily converted into such a vehicle by the use of some form of trailer. This utilization of motor cars has been made by several of the automobile manufacturers, in Detroit at least, who have put some of their factory cars to freight use by constructing two-wheeled contrivances from surplus parts, such as frames, extra axles and wheels and towing these trailers, putting them to the same service as they would light delivery vehicles.



General view of Detroit two-wheeled trailer Model A, and sketch showing attachment to runabout

Recognizing the demand for such vehicles, the Detroit Trailer Co. has brought out a trailer of this type, constructed entirely of standard automobile parts, as a solution of the light delivery problem. The method of use and the general appearance of the Detroit Trailer is shown in the accompanying illustration, which also shows its attachment to a small runabout.

In enumerating the many uses to which such a contrivance may be put the concern states that it is of special interest to contractors, grocerymen, hardware men, dry goods houses, farmers, summer residents and tourists. The last two types of users may appear rather doubtful to many, but the concern points out that summer residents will find it very convenient in transferring different articles and baggage to and from the city, while tourists are assured that the trailer may be attached to the machine to carry the always great amount of extra baggage needed on a tour, thus leaving the automobile unhampered and not loaded up with baggage.

These trailers are made in two types, models A and B, the former being a two-wheeler and having a capacity of 1,200 pounds. It has a standard I-beam axle and the wheels are of the artillery type of second growth hickory, provided with standard solid rubber tires, size 32 inches by 2 inches. These wheels are mounted on Bower truck type roller bearings, while the frame is suspended from the axle by regular full elliptic automobile springs. The dimensions of the stake body for model "A" are 96 inches length by 42 inches width. The sides are 18 inches high. This smaller type is also furnished with a canopy top, either with a square or round bow, for camping or fishing parties. The makers convey the further information that the vehicle can also be furnished with special springs for sleeping in the trailer, while an ice box attachment fastens directly under the rear end, at extra cost.

The Model "B" trailer is a four-wheeler. It is also constructed of standard truck parts and the body is suspended by semi-elliptic springs from standard I-beam axles, the wheels of artillery type being carried on Bower roller bearings. This heavier model has a wheelbase of 130 inches and a capacity of 3 tons. It is suitable for use in connection with any standard truck of 1-ton capacity or over and is intended for the delivery of coal, lumber and so on. It is claimed to be really a 3-ton truck, minus the engine and transmission. The overall body dimensions are 16 feet length by 54 inches width.

The use of such a trailer for commercial purposes suggests that one of lighter build capable of carrying a few hundred pounds load might prove an exceedingly useful accessory for the private owner. It frequently happens that the touring car, though generally capable of providing space for the assortment of bags and other impedimenta of a touring or camping trip does so at the inconvenience of the occupants. A great deal of the comfort of traveling, for instance, is lost if one's feet are confined to a space limited by carrying luggage inside the tonneau. To avoid this many things that would be found useful during the trip are left at home.

This is where the utility of a light trailer might make itself evident. Desirable constructional features of such a vehicle would be low build, and so made that it could be brought up fairly close to the rear of the car in order to avoid possible trouble when turning sharp corners. A narrow tread would also lessen the danger of accidental contact with the curb or passing vehicles when turning sharply.

Coal Delivery by Trailer

The high cost of transportation in the retail coal trade has prompted at least one company, the Citizen's Coal Co., of Waterbury, Conn., to adopt the tractor method of delivery in that town. The results are entirely satisfactory, the increased efficiency due to lowering the transportation cost and the greater promptness of delivery obtained, being very marked.

This firm uses a Knox-Martin tractor in connection with three detachable body trailers of 7 tons capacity each. These trailers are of the two-wheeled type and are provided with a pair of hinged jacks at the forward end which support the body when the tractor is withdrawn. On arriving at a residence at which the load is to be delivered it is only necessary to drop the two jacks in place, remove the king pin of the coupling, and the tractor is then available for other service while the trailer delivers its coal.

It takes from 30 to 50 minutes to carry in one of these loads of coal, so that while this body is being emptied the tractor has time to go back to the yard and haul out another body which has been loaded in the meantime, subsequently returning and taking back the other empty body to the yard for refilling.

In this manner the expensive part of the outfit, namely, the tractor, can be kept constantly at work with a high earning capacity, whereas with horses or the conventional motor truck, a large amount of time is necessarily wasted during the loading and unloading, with consequent increase in cost.—*The Carriage Monthly.*

Special White truck used by the Eastern Torpedo Co., Bartlesville, Okla., for the transportation of nitro-glycerine in the oil fields

Special Truck Carries Nitro-Glycerine

Novel Body Designed To Cushion Jolts and Protect Explosive Fluid from Leaks and Heat

IN Oklahoma they "shoot" the oil wells just about the same as a New York subway contractor would blast his way through a wall of rock except that nitro-glycerine is used in the wells and dynamite is used in the subways. In either case, the use of great quantities of a powerful explosive has been accompanied by a ticklish transportation job and periodically the vehicle, the horse and the driver go aviating in atoms and are never seen again—all of which has taught the necessity of protecting the load to the greatest possible extent.

To guard against these events a number of interesting types of conveyance have been developed and a few motor trucks have made single hauls now and then but the Eastern Torpedo Co., Bartlesville, Oklahoma, is the first distributor of explosives to regularly use a motor truck in this kind of hauling. The company is not only using a motor truck but is planning to motorize its entire delivery.

A special body of novel design was built on a standard 1,500 pound White truck chassis and the truck is now in service in Bartlesville, being piloted by a driver who is cheerfully indifferent as to the nature of his load. It was not such an easy task, however, to demonstrate and deliver the truck, none of the White drivers being willing to take the wheel when the truck was loaded. It was therefore delivered but not demonstrated.

The mid-continent oil fields in which the truck is operating cover a vast area south of Bartlesville, including such well-known oil-producing sections as Tulsa and Muskogee counties. The roads run fair to very bad and this fact alone creates difficulty in general hauling to say nothing of the added responsibility of carrying a cargo of explosives big enough to blow Bartlesville off the map.

The Eastern Torpedo Co. sells most of the nitro-glycerine that is used in "shooting" the wells and the company delivers it to some almost inaccessible places. The hauls vary from 3 to 50 miles. When a well has been drilled and the usual 8-inch pipe is in place, it is necessary to quicken the flow of oil by subsurface explosions and the customary method is to attach a can of nitro-glycerine to a cable and lower it by means of a reel through the 8-inch pipe. When the can reaches the bottom, the simple expedient of dropping a rock on it ignites the charge.

Crosswise and lengthwise of the frame is built a series of sills of heavy, long-leaf yellow pine. This understructure spans the entire loading length. The latter is only 47.5 inches long, leaving an open platform in the rear for the carrying of the reels that are used in lowering the cans into wells. The understructure is covered with a layer of asbestos and on top of the asbestos there is a solid floor of pine. A rubber mat tops the pine floor and on this mat there is a copper pan of full width and length, having sides which rise 5 inches all around.

The asbestos is intended to prevent heat being conducted to the load from either the engine, exhaust pipe or muffler; the rubber mat helps to reduce jolts, and the copper pan is to prevent the fluid from reaching the chassis in case a leak should occur in one of the cans. Each can is placed in a compartment 7 inches by 7 by 17 and there are thirty of these compartments dividing the copper-bottomed loading space. They are formed by poplar boards dovetailed together and running lengthwise and transversely of the frame. These compartments, or cells, have a poplar cover which is divided into two sections, the forward section hinged at the front and the rear section hinged in the rear with a lock in the center.

To facilitate loading and unloading—particularly when the driver alone does the unloading—the right rear fender immediately above the wheel is converted into a step and running board on which cans of nitro-glycerine may be rested while the driver is in the act of jumping down from the truck platform.

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TO IMPROVE a good automobile calls for more specialized and differentiated positive knowledge than the original construction of it. For a few years yet, untiring study must be the price of prominence in the automobile industry, and it is doubtful if the work can be hired done.

New Warner Motor Is of Block Type

Applicable to All Kinds of Installations Without Serious Alteration—Thermo-Syphon Cooling Is Used

WHEN H. L. Warner severed his connection with the Warner Gear Co. and the Muncie Gear Works, Muncie, Ind., he came to Detroit and organized the Warner-Detroit Motor Works for the manufacture of a motor of his own design. The announcement of this was made in THE AUTOMOBILE some time ago, although no details of the new power plant were given at that time.

The details have now been secured and sectional views of the four-cylinder type to be manufactured are shown herewith. These Warner-Detroit motors have been designed to be applicable to all types of installations without fundamental change. That is, the motor may be suspended either at the front or back of the cylinders on a cross bar, giving a three-point suspension in either case; the flywheel is machined to fit either a cone clutch or a multiple-disk design; the rear end of the crankcase is made to carry a flywheel housing or this may be dispensed with, leaving the flywheel exposed.

The four-cylinder model which is typical of these new Detroit engines is a monoblock type giving a compact design. It is water-cooled by the thermo syphon system, the water jacket running completely around the cylinder casting in the usual way. The water outlet connection extends completely across the top of the cylinders, giving a very free outlet passage for the cooling water. The diameter of the hose connections to and from the radiation is 2 1-2 inches, insuring an adequate flow of cooling water to and from the water-jackets.

The motor is of the long-stroke type, having a bore of 3.19 inches and a stroke of 5.5 inches. This bore was adopted principally so that the engine would come within the foreign requirements. The valves are all on the right side, springs, valve tappets and so on being completely inclosed by cover plates. The crankshaft has two main bearings, while the camshaft is provided with three.

The principal dimensions of the four-cylinder model follow:

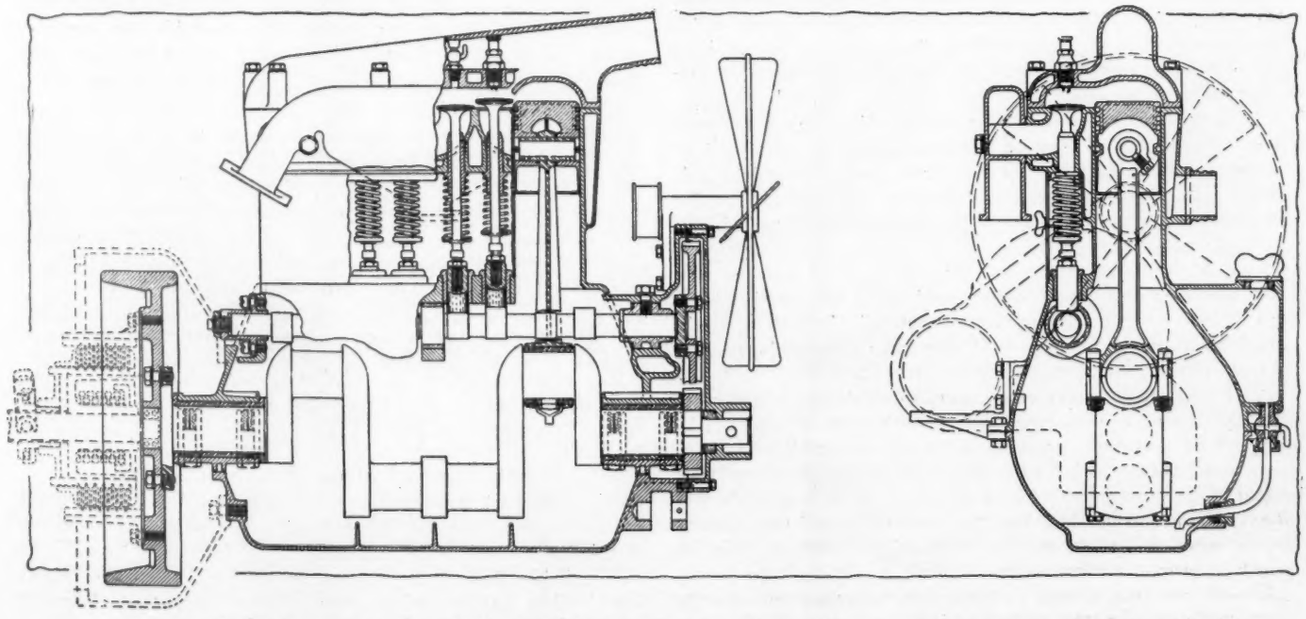
	Diameter	Length
Front main bearing crankshaft	2.25 inches	4 inches
Rear main bearing crankshaft	2.25 inches	4.5 inches
Connecting-rod bearings	2.25 inches	2.5 inches
Camshaft diameter	1.125 inches	
Diameter valves	1.5 inches	
Diameter magneto or timer shaft	1 inch	
Width of cams		1 inch
Width of timing gears		.88 inch
Overall length of motor		31.56 inches
Overall width of motor		19.06 inches
Number of piston rings		3

The motor is made with an integral base on the right side of the crankcase which is machined to take any standard magneto, while either a 1, 1.25 or 1.5-inch carbureter may be equipped.

Lubrication is by means of the conventional splash system, there being individual troughs to contain the lubricant under each connecting-rod, which troughs are cast integral with the lower half of the crankcase. The connecting-rod ends dip into these troughs of oil as they travel around and throw the lubricant up into the cylinders to oil the pistons. The oil reservoir is cast integral with the left side of the upper half of the crankcase, the oil flowing from it down through a pipe into the troughs.

With its long stroke, the motor will develop considerably more power than that accorded it by the S. A. E. formula. This gives the four-cylinder model a horsepower of 16.2, while if the stroke is considered, it figures to about 17.5 at 1,200 revolutions a minute and 24 at 1,600 revolutions.

A VERY FREQUENT CAUSE for the rut-worn tire is traveling on a surface which has not been frozen solid, but is in such a condition that a thick crust has been formed. At such times the car will be supported from time to time and then will break through, shearing off such pieces of rubber as the knife-like edges of the broken crust will strike. This cannot be avoided unless it is possible to travel by another road, but where the ruts are likely to cause damage this can often be avoided by just simply not getting into the ruts. Many of the roads are posted with signs instructing drivers to be careful in not traveling continuously over the same path in the road. This is especially the case of newly constructed state roads. Despite these warnings, however, drivers of heavy trucks and other horse- and motor-driven vehicles persist in following the ruts made by previous drivers. In the case of passenger automobiles using pneumatic tires this is not only detrimental to the roads but to the tires of the vehicle, as has been explained. It is very easy in many cases to straddle the ruts.



Part sectional views of side elevation and end of the new four-cylinder Warner motor, showing the compact design

SPRINGFIELD, O.—Editor THE AUTOMOBILE—Interchangeable parts rather than standardization of motor trucks is the answer to the question now confronting the United States Government. This solution will not only benefit the government, but will work to the advantage of all big business concerns using large fleets of trucks.

The United States recently asked for the opinions of the leaders of the leading motor truck engineers on the practicability of standardizing a truck for the use of the army.

After considerable thought I believe that the time is not right to attempt the standardization of trucks. The time is ripe, however, for the leading truck manufacturers of this country to get together and agree upon a definite working plan which would help the government and themselves.

The leading motor trucks are designed upon sound conventional principles along the lines of conventional type mechanism.

If the amount of business to be secured would warrant it, we believe that a considerable number of the leading manufacturers could get together and change a few main dimensions on their machines so that the units of different machines could be interchanged.

The main points to be decided are:

1. Uniform width of frame.
2. Uniform length of wheel base.
3. Uniform loading space back of driver's seat.
4. Uniform size of wheels and tire equipment.
5. Uniform sprocket centres.

The simplicity of these changes can readily be seen when it is considered that the last three items are optional in the equipment of most manufacturers.

A glance at the detailed workings of the plan also shows its extreme simplicity.

The hub bearings on certain trucks are practically interchangeable today. It would be a simple matter to standardize the width and length of springs. This would make both axles interchangeable in units without any further changes as the threads are now standard.

The jackshaft and transmission units need to be interchangeable only as to their seats in the frame angle. This could be done easily after the width of the frames has been made standard. To do this, of course, would make it necessary to consider the driveshaft and universal joints units with the transmission and jackshaft.

It would be necessary to standardize the cone clutches only as to diameter and width of face, and as to the length of the clutch between the flywheel and the front end of the drive shaft, or transmitting unit. This would also mean the standardization of the bore of the flywheel for the clutch seat.

Practically all the carbureters, magnetos and wiring and gasoline connections can be standardized with little trouble as the majority of manufacturers are now using standardized articles for these purposes. The only details remaining to be worked out in this connection would be the sizes of the union connections. The length of pipes are very much alike, and other things would make little difference as connections could be bent or coiled up in case of emergency.

It would not be necessary to make such things as pedals, gears, brake and clutch control parts standard, as if these were made of a good, reliable grade of drop forgings there would be hardly any necessity to replace them.

The principal advantage of the plan submitted here lies in the fact that each maker of motor truck could retain his individuality and independence of opinion and judgment in design and construction. To change the point suggested would be comparatively simple as the bulk of the tool equipment of the motor truck manufacturer would not have to be changed in any way.

The new parts that would be necessary, if this plan were put into operation, could be independently tooled up and treated as any other special equipment. These changed parts could be produced with economy if they were ordered in sufficient quantities.

I believe that a board of engineers representing the leading truck manufacturers could work this proposition out to mutual satisfaction. If the government were willing to divide their purchases equally among the companies represented in this mutual plan, the details could be satisfactorily worked out.

Especially in the case of trucks for use of the War Department would this plan be beneficial. In times of real war, or even during maneuvers there is so much haste that it would be impossible for the soldier-mechanician to make any small or delicate adjustments. It would be far simpler to interchange entire units of construction from trucks which are out of commission to other trucks with little delay.

It appears to the writer that it would be impossible to put a new gear in a transmission or a new differential in a jackshaft, or even a new piston in the motor. It would be much simpler, and could be done with little delay by the placing of entire units into the remaining trucks. This would mean only the taking out of bolts and nuts and would require little or no real mechanical skill and adjustment.

To my mind this plan possesses all the advantages of the standardization of motor trucks without any of its disadvantages. I firmly believe that it is practical, and would effect a great saving for the government and the motor truck manufacturer interested if it were put into operation—CHARLES BALOUGH, Kelly-Springfield Motor Truck Co.

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Interested in Spring Development

LOS ANGELES, CAL.—Editor THE AUTOMOBILE:—The excellent article in your number of April 17, 1913, by Prof. Dr. Riedler of Berlin, Germany, on springs for automobiles, and his opinions on shock absorbers which are hereinafter quoted, may make it of interest to the readers of automobile literature to follow the progress of automobile spring suspension to its latest development.

From Dr. Riedler:

"In running over a ridge or furrow the wheels no longer hit the road but the higher or lower surface of the obstacle, and the vehicle spring, ing compressed by the first impact, has no chance to rebound toward d but must spend its stored energy upward against the heavy y, which is thrown upward until the springs are entirely extended. By this action the vehicle body is unavoidably thrown up so high that when it comes down again by gravitation it compresses the springs till the frame comes down hard against the axle. Such excessive oscillations of springs can only be avoided by cautious driving. Dampers on the spring action can be justified only when they guard against excessive upward movements of the vehicle body. They should therefore take effect only at the moment when such movements begin, but not before. Most dampers, and particularly all the elbow-joint dampers, work on just the opposite principle and are therefore valueless. Hydraulic dampers can be made to operate correctly, but are too complicated (umständlich)."

It is unquestioned by Dr. Riedler or any other authority that there is only one weight of body and passenger load for a given spring suspension, which will give ideally comfortable riding, for with a heavier load the axles will be hit sometimes by the frame, and with a lighter load the springs will be stiffer than are comfortable, and in consequence, automobile manufacturers build for the heavier, not the lighter load, as pounding on the axles is ruinous to both body and gear.

If reliable devices to control recoil were available, which would allow lighter springs with 10 or 12 inches of clearance over their axles to nearly close on an excessive bump, without

allowing excessive overthrowing on its recoil, they could improve materially on present day practice of striking a rubber bumper upon closing 4 or 5 inches in order to keep the passengers in the car, the theory being that with slight compression there will be slight recoil.

Most manufacturers of so-called shock absorbers (dampers) have assumed that retarding means to keep the springs from closing or hitting the axles, and is desirable and necessary. They have not profited by their study of the forces which are acting or they would know that when the excessive opening, or recoil, or overthrow of the springs, as it is variously called, is stopped by some frictional dampening means, not by spring means, there is no downward acceleration of the vehicle body due to the back-pull of the vehicle springs, hence only the force of gravity is acting on the automobile body, and if the springs are of proper weight, the axles will not be hit by the frame. Any friction which retards the closing of the spring, injures the resiliency of the same and makes for harder riding and that chattering motion so undesirable.

The action of vehicle springs on a rough road with reference to the comfort of the passenger is as follows:

As the wheels surmount an obstacle in the road the springs are compressed, and before final descent over the obstacle, the recoil has projected the automobile body and passengers upward. This momentum of the body opens the springs above their normal without load, and at about the moment when the wheels have rolled over the obstruction, still further opening the springs, the body is pulled back to earth by gravity plus the back-pull of the overthrown springs, while the passenger is pulled back to earth more slowly because by gravity alone, and this is the reason he is left in the air, and when he strikes the seat, it is on its secondary ascent to meet him, and the contact is never pleasant.

Now let us analyze the effects of the different types of dampers, up to this time available:

The elbow type is a friction damper having equal friction in both directions and if tightened enough to effectively overcome recoil above the normal, it so injures the spring resiliency upon compression as to destroy its usefulness as a comfort device.

The elbow type in which the friction is obtained by a cam, which upon being turned compresses springs, enclosed in the device, injures resiliency of the vehicle springs, and is also a fixed neutral position device which allows free movement of the axles for slight road variations, without frictional retarding effect upon the opening or closing, but if set for the neutral position when two passengers are riding, upon the load being increased to seven passengers it is in the jammed position when the car is at rest instead of in the neutral one, which is most undesirable.

The spring recoil check, in its various forms, whether a spring on the end of a strap, in the form of a spring-controlled toggle, or a spring directly connected between axle and frame, only adds to the back-pull of a vehicle spring when it has been thrown above the normal, and therefore assists the spring in pulling the automobile body to earth before the passenger has started to descend.

The strap can be made to keep the spring at or slightly below normal and therefore do away with back-pull, but on the recoil of the spring, if the body is so suddenly stopped, the passenger is projected upward and comfort is not added to, although strains on the mechanism are undoubtedly somewhat modified.

The hydraulic device, of a piston and piston rod, descending freely through its stuffing box, cylinder and contained liquid when the spring closes, and on the recoil forcing part of this liquid through an adjustable opening, thereby giving the desired amount of friction, will undoubtedly operate satisfactorily, but with the leakage of the liquid through the stuffing box, and the pressure being upward of 200 pounds per square inch against it, with the consequent admission of air to take the place of the liquid so lost, the device becomes elastic on its back-pull, for what is more elastic than compressed air, and in addition, this spring recoil check is obtained with much attendant and cumbersome weight.

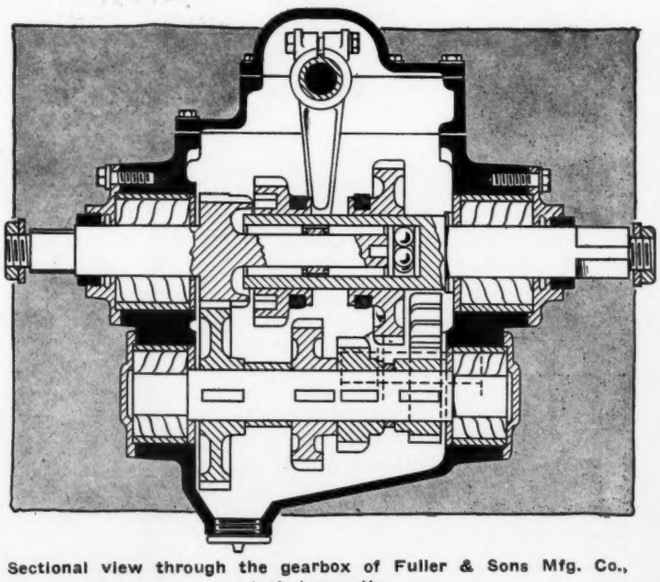
A Spring Controller—The writer is the patentee of a device which is designed to overcome the several faults enumerated above in connection with the various forms of shock absorber and in particular to overcome the secondary back-pull of the vehicle springs after passing over a lump in the road surface. In this device a series of friction plates is arranged in conjunction with a rachet connected to an outer lever in such a way that on the upward throw of the axle the rachet slips and the friction plates remain stationary but on the return stroke the plates are put into action with a retarding effect on the spring motion. This virtually eliminates the rebound of the vehicle spring and therefore only the force of gravity is acting on both the automobile body and passenger after a sudden lift. Hence they descend together and the shock is absorbed by the long throw of the vehicle spring.

Many of these devices are in use in this city and one set has traveled around the world.—H. C. TURNER, Vice-President Turner Oil Co.

Testing the Factor of Safety

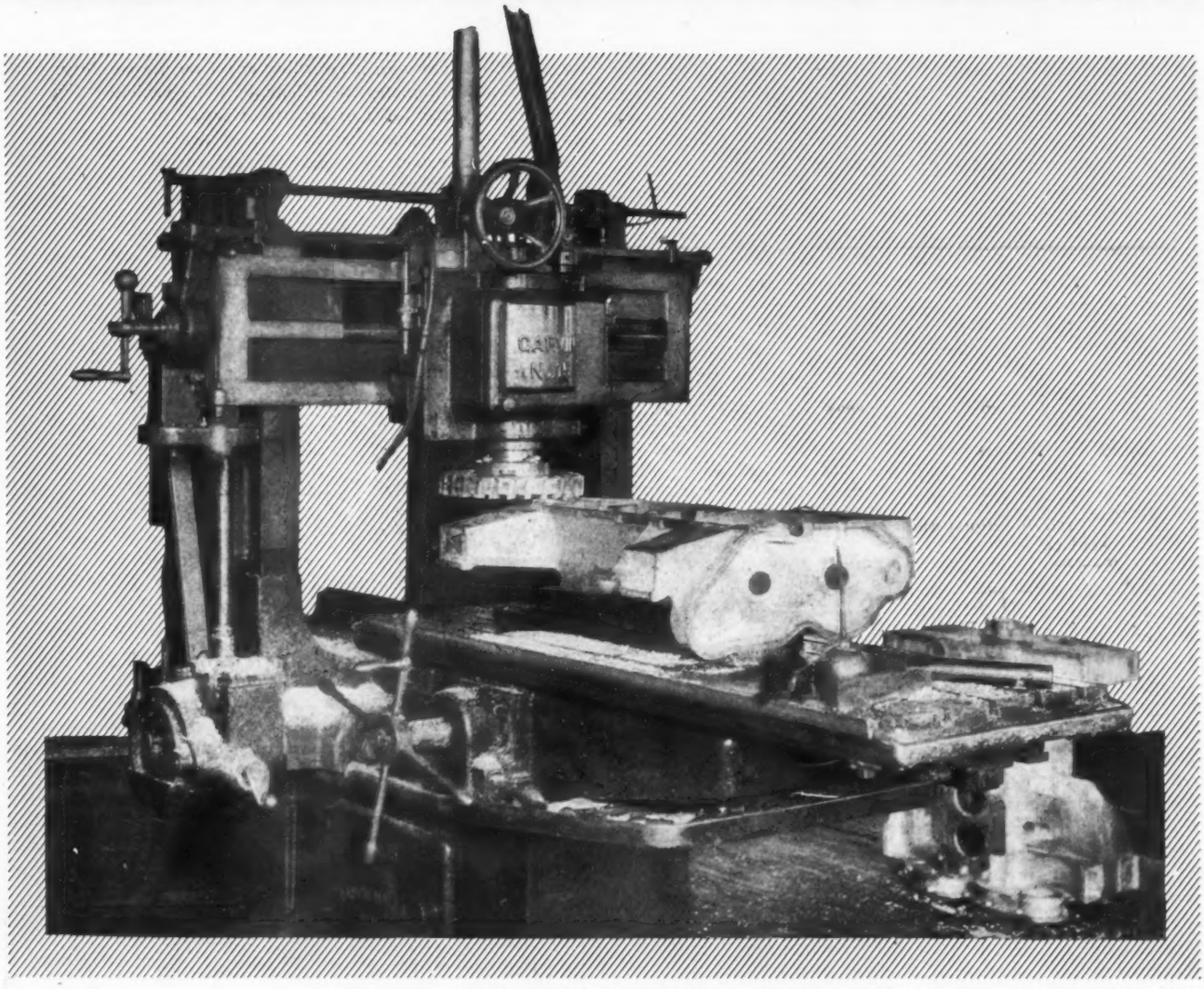
KALAMAZOO, MICH.—In order to prove conclusively that the factor of safety in their transmission set was high enough to insure long life the Fuller & Sons Mfg. Co., of Kalamazoo, Mich., recently subjected one of their standard 25-35 horsepower gear-sets shown in the accompanying illustration, to a severe test as follows:

A standard transmission taken from stock, was securely bolted down to a solid foundation. A large steel bar held the rear mainshaft square end from turning, and the gears were shifted into the low speed. Next a heavy steel bar, 8 feet long, was placed on the front end and a man of average size placed his weight on the long bar at different positions, moving out toward the end of the long bar in steps of 3 inches. This was done repeatedly until a twisting movement, equal to 229 horsepower was exerted on the gears, shafts, bearings and case, before any fracture occurred. In other words, the transmission stood a twist equal to a 229 brake horsepower load, a sufficient indication that the 25-35 rating is conservative and the factor of safety such as to meet all possible conditions of use in the automobile. Tests of this character are especially interesting nowadays that manufacturers are finding the public more intimately acquainted with automobile construction than in the past. The factor of safety is a most important consideration in any part.



Sectional view through the gearbox of Fuller & Sons Mfg. Co., tested recently

Factory Miscellany



Crankcase milling machine used in the factory of the Moon Motor Car Co. at St Louis, Mo.

IN the factory of the Moon Motor Car Co., St. Louis, Mo., a special milling machine of the type shown in the above illustration is used for milling the aluminum crankcases used on Moon engines. This machine carries a 16-inch diameter inserted tooth cutter, the teeth of which are made of a special steel costing over $1 per pound. The milling of either the top of bottom of the upper half of crankcase is accomplished with only two cuts, the first cut removing .125 inch of metal. After this cut is taken, the crankcase is removed from the machine, put in a special chemical bath and allowed to set for several days in order to remove any strains that may be in the metal. It is put back in the machine and a finish cut of .012 is taken.

The bottom of the upper half of the Moon crankcase is 21 by 33 inches and the first cut requires 17 minutes. The second cut requires 11 minutes. The top of the upper half of the crankcase is 12 by 24 inches and the first cut here requires 12 minutes and the second 8 minutes. This also includes the milling of the magneto brackets and the self-starter bracket. This machine is operated entirely by one man and although several days elapse between the time the first and scond cut is taken on each crankcase no time is lost, as each crankcase is numbered, dated and put in its chemical bath, thus allowing one to be taken out as fast as a fresh one is put in. As may be imagined, the saving effected over the old methods by the use of this machine is very great.

FACTORY GROWTH IN QUEENS—The Goodyear Import Co., which is constructing an eight-story $225,000 factory at Jackson and Honeywell streets, Long Island City, recently made application to build a five-story $35,000 addition to the plant. The Ford Motor Co., which is about completing an eight-story building at Jackson avenue and Harold street, also has purchased an entire block adjoining and bounded by Honeywell street, Fifth and Jackson avenues, and will erect a ten-story building at a cost of nearly $1,000,000. The Neptune Motor Co., which recently took out permits for the erection of a five-story factory in addition to its present plant at Jackson and Crane streets, applied also to erect an $18,000 one-story brick foundry on a plot 100 by 123 feet.

Mather Spring Addition—Plans are being drawn for an addition to the factory of the Mather Spring Co., Toledo, O. The business of this concern has grown so rapidly that the additional space is necessary.

Palmer Starts First Factory—The Palmer Motor Car Co., Detroit, Mich., recently organized, has begun the construction of the first unit of its plant which will be located at Ecorse, a Detroit suburb. The structure will be of reinforced concrete construction, one story, and 80 x 355 feet.

Apperson Taking Bids—The Apperson Automobile Co., Kokomo, Ind., is taking bids for the erection of a three-story factory building to cost $20,000.

Plant for Bellefonte—The recent incorporation of the Bellefonte Automobile Mfg. Co., maker of the Bellefonte automobile, has bought a factory at Bellefonte, Pa.

Fire in Automobile Plant—Fire was recently discovered on the second floor of the three-story brick building occupied by the Ohio Electric Automobile Co., Toledo, O. The flames originated from spontaneous combustion in waste matter.

Ford's Seattle Plans Finished—The plans and specifications for the Ford Motor Co., Detroit, Mich., assembling plant to be built at Seattle, Wash., at a cost of $400,000, are finished. Bids were received on the building on June 10. Considerable machinery will be bought.

Cole's $175,000 Plant—A contract has been let by the Cole Motor Car Co. for a large addition to its plant in Indianapolis, Ind., and work has been started. The contract price, exclusive of machinery, etc., is $175,000. The structure will be four stories high and of brick, steel and reinforced concrete construction.

Iron Foundry for Lewis Electric—A new gray iron foundry to supply castings used in the construction of motor parts manufactured by the concern is to be built by the Lewis Electric Welding & Mfg. Co., in West Toledo, O. A specialty of medium and light-weight high-grade iron castings will be made.

Oakland at Full Capacity—The Oakland Motor Car Co., Pontiac, Mich., is running its plant at capacity to fill orders and more than 1,100 men are employed. During May the daily shipments averaged fifty cars. There are over 1,200 dealers. The total business for the season will be approximately $15,000,000.

Amplex Building 7,000 Motors—The Amplex Motor Car Co., Mishawaka, Ind., is building 7,000 motors for the Empire Automobile Co., Indianapolis, Ind. Mr. Mead, president of the Amplex company, said the company would make 50 motors in July, 150 in August and after 500 motors per month until the present contract is completed.

College Men in Factory—Many college men from all over the countrty are planning to work during the summer vacation in the factory of the Goodyear Tire & Rubber Co., Akron, O. The company recently requested the college men in the company to write to their colleges asking for men, and the responses have been numerous.

Overland Planning More Buildings—The Willys-Overland Automobile Co., Toledo, O., is having plans drawn for $200,000 worth more of new buildings. A brick testing track is being constructed. The Kinsey Mfg. Co., a branch of the Willys-Overland Co., is arranging for the construction of a warehouse which will approximate 300 feet in length.

Explosion in Goodyear Plant—A gas explosion in the basement of the six-story office building of the Goodyear Tire & Rubber Co., Akron, O., recently started a fire which caused $10,000 damage. The explosion ripped a hole in the first floor of the building, and the fire which followed caused four hours' vigorous fighting by the fire department before it came under control.

Newark Secures Pharis Tire Factory—By an agreement entered into recently by officers of the Pharis Tire & Rubber Co. with the Board of Trade, Newark, O., secures an industry which Columbus and Chillicothe have each sought. The rubber concern agrees to employ not less than forty men at an average yearly salary of not less than $700 during the first 6 months, and will at once install a plant requiring nearly $30,000 worth of machinery at the outset.

Automobile Plant for Meriden—President C. B. Schoemehl of the Waterbury Battery Co., Waterbury, Conn., is the prime mover in the plan to establish an automobile factory in the idle plant of the Meriden Woolen Co., Meriden, Conn. It is expected to employ 300 men at the start. Outside capital will have about 75 per cent. of the investment of $200,000, and Meriden men will invest the remainder if the scheme goes through. The car to be made is a $1,000 car and has been manufactured on a small scale in New York.

New Timken Roller Bearings Factory—Officers of the Timken Roller Bearings Co. announce that they will erect an addition this summer which will provide for the employment of 200 additional men. Plans for the buildings have not been prepared and will not be commenced until negotiations for additional land are concluded. The company, however, will try to have the plant completed by fall. Either two or three buildings of reinforced concrete will be constructed. J. G. Obermier states that the improvements will adjoin the present plant.

Shows, Conventions, Etc.

October 13..... Philadelphia, Pa., National Fire Prevention Conference, Philadelphia Fire Prevention Commission.
December 9-12..... Philadelphia, Pa., Annual Convention of American Road Builders' Association.

Race Meets, Runs, Hill Climbs, Etc.

June 19..... Chicago, Ill., Algonquin Hill Climb, Chicago Motor Club
June 21..... Cincinnati, O., Hill Climb, Cincinnati, O., Automobile Dealers.
June 21..... Philadelphia, Pa., Fletcher Cup Run, Automobile Club of Philadelphia.
June 21-22..... San Francisco, Cal., Track Races, E. A. Moross.
June 23..... Des Moines, Ia., Little Glidden Tour, Iowa Automobile Assn.
June 25-28..... Chicago, Ill., Non-Motor-Stop Reliability, Chicago to Boston, Chicago Automobile Club.
July 1..... Indianapolis, Ind., Tour of Indiana Automobile Manufacturers' Assn. to the Pacific Coast.
July 1-16..... Winnipeg, Man., Motor Plow Competition, Dr. A. W. Bell, Manager.
July 4..... Columbus, O., 200-Mile Track Race, Columbus, O., Automobile Club.
July 4..... Taylor, Tex., Track Meeting, Taylor Auto Club.
July 4..... Washington, D. C., Track Races, National Capital Motorcycle Club.
July 4-5..... Sioux City, S. Dak., Track Meetings, Sioux City Automobile Club and Speedway Assn.
July 5-6..... Tacoma, Wash., Road Race, Montemara Festa Automobile Committee.
July 8-16..... Winnipeg, Man., Midsummer Exhibition, A. C. Emmett, Manager.
July 11..... Twin City, Minn., National Reliability Tour, A. A. A.
July 20..... Seattle, Wash., Track Races, E. A. Moross.
July 27..... Grand Rapids, Mich., Tour, Grand Rapids Auto Club.
July 27-28..... Tacoma, Wash., Tacoma Road Races.
July 28-29-30..... Galveston, Tex., Beach Races, Galveston Automobile Club.
Aug. 5..... Kansas City, Mo., Sociability and Endurance Run from Kansas City to Colorado Springs, Col., Kansas State Automobile Assn.
Aug. 12..... Kansas City, Mo., Reliability Tour, Kansas State Auto Assn.
Aug. 29-30..... Elgin, Ill., Elgin Road Races, Elgin Road Race Assn.
Aug. 30-Sept. 6.... Chicago, Ill., Reliability Run, Chicago Motor Club.
Sept. 1..... Columbus, O., 200-Mile Track Race, Columbus Auto Club.
Sept. 9..... Corona, Cal., Track Race, Corona Auto Assn.
Oct. 4-11..... Chicago, Ill., Around Lake Michigan Run, Chicago Motor Co.
Nov. 24..... Savannah, Ga., Vanderbilt Cup Race, Motor Cups Holding Company.
Nov. 27..... Savannah, Ga., Grand Prize Race, Automobile Club of America.

Foreign.

June 23-28..... London, England, International Road Congress.
July 12..... Amiens, France, Grand Prix Race.
July 13..... Paris, France, French Grand Prix Cyclecar Race.
July 15-30..... London, Eng., Olympia Heavy Motor Vehicle Show.
July 18-26..... London, Eng., Imperial Motor Transport Conference.
Aug. 28-30..... Ghent, Belgium, Institute of Metals, Annual Autumn Meeting, Ghent International Exhibition.
Sept. 21..... Boulogne, France, 3-Litre Race.
Sept. 25..... Isle of Man, International Stock Car Race.
October ..... Paris, France, Automobile Show, Grand Palais, 10 days.
November ..... London, Eng., Annual Automobile Exhibition, Olympia.

Warehouse, assembly and finished parts department of the new factory of the Duff Mfg. Co., Pittsburgh, Pa. The photograph was taken prior to occupancy.

The Week in the Industry

Engineer — Dealer — Repairman — Garage

View of a day's output of the Hupp Motor Car Co., Detroit, Mich. Cars are lined up for inspection

Circus tent in yards of Hupp Motor Car Co.'s factories, Detroit, Mich., used for a temporary test department

CANADA RECIPROCATING ON PASSPORTS—In view of the fact that the United States government has agreed to recognize membership cards in the Ontario Motor League as passports, and that automobiles entering at one part are allowed to make clearance at another, the Motor League has decided to petition Hon. J. D. Reid, Minister of Customs for the Dominion, to allow a similar privilege to the United States motorists.

DAHL TIRE IN PORTLAND—The Dahl Punctureless Tire Co. has settled in Portland, Ore.

HIGHWAY CONVENTION IN VANCOUVER—The annual Pacific Highway Convention will be held in Vancouver, B. C., August 11 to 13th.

NORMAN FORD PORTLAND MANAGER—F. B. Norman has become manager of the Portland, Ore., branch of the Ford Motor Co., Detroit, Mich.

BOULDEN WITH SERVICE RECORDER—H. T. Boulden has been made vice-president and general manager of the Service Recorder Co., Cleveland, O.

MURDEN KNICKERBOCKER MANAGER—H. H. Murden has been appointed factory manager of the Knickerbocker Motor Truck Mfg. Co., New York City.

MACDOUGAL HAYNES SALES MANAGER—J. E. MacDougal has been appointed sales manager of the Pittsburgh-Haynes Automobile Co., Pittsburgh, Pa.

THATCHER OAKLAND TREASURER—H. H. Thatcher has been appointed treasurer of the Oakland Motor Car Co., Pontiac, Mich. He will also continue as supervisor of Michigan sales.

J-M ABSORBER BRANCH OPENED—A sales branch for the J-M Shock Absorber Co. has been opened at 425 North Meridian street, Indianapolis, Ind. M. Matthews is manager of the new branch.

ADDING TO GARAGE—The Seguin Auto & Cycle Co., Seguin, Tex., is building an addition to its garage, and when completed will be 50 by 100 feet, with the repair shop, 20 by 50 feet, of fireproof construction.

WOOLER JOINS CONTINENTAL MOTOR—E. Wooler has become a designer for the Continental Motor Mfg. Co., Detroit, Mich. He was recently in the designing department of the Rolls-Royce, Ltd., a British automobile concern.

FIRE IN PHILADELPHIA GARAGE—Automobile materials and several machines left for repair work were burned recently in a fire which did damage roughly estimated at $10,000 to the building of the Empire Auto Top Co., Philadelphia, Pa.

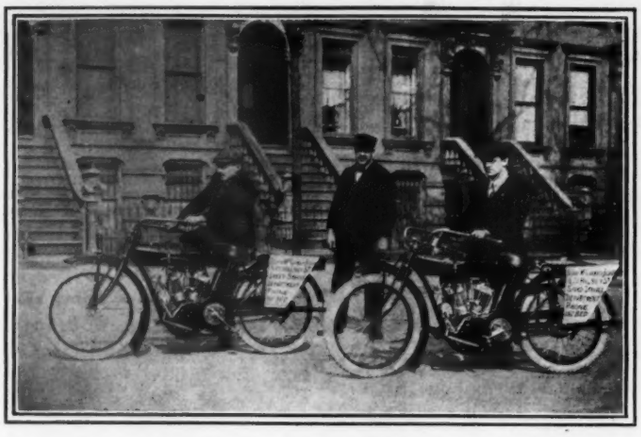
MORE AUTOMOBILE FREIGHT CARS—Included in an order for $10,000,000 worth of new equipment now being received by the Atchison, Topeka & Santa Fe Railroad are 1,400 new furniture cars which will be used mainly in the automobile trade in the southwest.

OVERLAND'S N. Y. $200,000 LEASE—C. T. Silver Motor Co., agent for the Overland car, has leased 1739 Broadway, with Nos. 237-241 West 55th street. It intends to make extensive alterations. The district has been gradually absorbed by theaters and restaurants. The lease calls for $200,000.

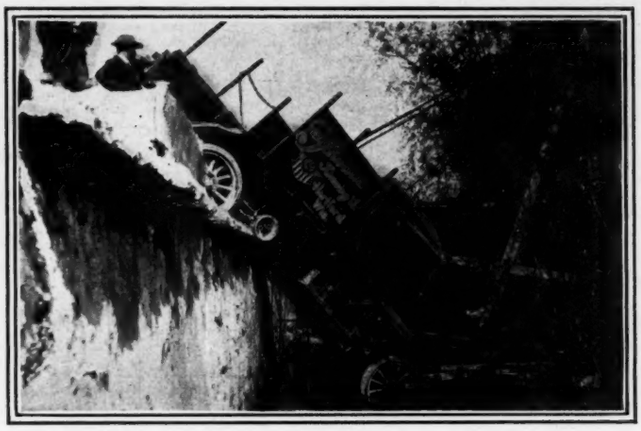
BOULEVARD 20 MILES LONG—After several years of effort on the part of automobile interests and good roads' advocates, the building of a boulevard connecting Indianapolis, Ind., and Noblesville is assured. The new boulevard will be more than 20 miles in length. It will be 60 feet wide.

LEAVES PEERLESS TRUCK DEPARTMENT—R. S. de Milkiewicz, Esq., who has been connected with the Peerless Motor Car truck department, Cleveland, O., has severed his connections with this firm. Mr. de Milkiewicz announces his affiliation with the American Locomotive Co., and on July 1 will be located in the New York branch of its truck department.

The group of members of the American Society of Engineers and their visitors, the delegates from the English



Service squad used in hurry calls by Bishop, McCormick & Bishop, Paige-Detroit dealers in Brooklyn, N. Y.



KisselKar truck plunged over a 10-foot stone wall with no more damage resulting than a flattened and twisted running board

HANDLING BRAENDER TIRES—The Braender tires are being handled in Baltimore, Md., by the Wyma Park Garage, with F. S. Brown as manager.

MILLINGTON RESIGNS FROM BUDD—T. H. Millington has resigned as general manager of the Detroit, Mich., plant of the E. G. Budd Mfg. Co., of Philadelphia, Pa.

THOMAS FEDERAL TRUCK MANAGER—C. K. Thomas has been appointed manager of the Federal Truck Co., of New York City, distributor of the Federal motor truck.

KLOSE RESIGNS FROM MAXWELL—O. W. Klose, district manager for the Maxwell Motor Car Co., in Minneapolis, Minn., recently resigned from that company, to go into business for himself.

BUS LINE IN CHILLICOTHE—R. M. Laird, of Athens, O., has started an Automobile passenger line between Chillicothe and Bainbridge, O., with two large sight-seeing cars capable of carrying twenty passengers.

HAYNES HOLDS CONVENTION—On June 19 and 20 the Haynes Automobile Co., Kokomo, Ind., will hold a convention at that city, the attendance consisting of advertising men, dealers and the prominent officials in the factory.

FORD'S ST. PAUL SERVICE STATION—Work has begun on the new Ford Motor Co.'s service station and salesroom at St. Peter street and University avenue, St. Paul, Minn. The building is to be three-story and concrete.

NEW BIRMINGHAM PARKING RULES—No vehicle is to be allowed to stand more than 20 minutes in the business district at Birmingham, Ala. This ruling is aimed principally at the parking of automobiles. Special policemen will see that the time limit is observed promptly.

ST. LOUIS TRUCK GARAGE—A garage for motor trucks, the first in St. Louis, Mo., is being erected in connection with the new building of the General Motors Truck Co. Space for forty trucks will be provided and entrance made so commodious that a 5-ton truck can enter without backing.

FRANKLIN'S BOSTON BUILDING—Work has been started on a three-story building on Commonwealth avenue, Boston, Mass., at the corner of Cummington street, which will be occupied by the Franklin Motor Car Co., Syracuse, N. Y. It is expected that the building will be ready for occupancy about the first of October.

DOUBLE-DECKERS FOR LOS ANGELES—The Pacific Motor Coach Co. recently placed an order for twenty-two Kelly-Springfield trucks with double-deck coach equipment in service in competition with the Pacific electric cars in Los Angeles, Cal. A 15-minute service will be inaugurated between Los Angeles and Venice and Los Angeles and Pasadena.

AUTOMOBILE BUSES IN TORONTO—The Board of Control of Toronto, Ont., has referred to the city solicitor the application for a franchise of a company to run motor buses on specified routes on the streets of Toronto. The agreement provides for the annual payment to the city of $500 per mile of street used on the routes up to the amount of $30,000.

LOWELL PAYS FOR APPARATUS—The controversy over the Knox fire automobile that was ordered for Lowell, Mass., fire department has been settled by the payment of the bill for the machine. Considerable politics were mixed up in the purchase of the machine, and before the trouble was settled the court was asked to rule upon the Lowell system of purchasing supplies.

NEW U. S. TIRE BUILDING—The United States Tire Co. has leased the lot of ground 5935 Baum Boulevard, Pittsburgh, Pa., and has broken ground for a new two-story and basement brick building, which it will use exclusively as a service station for its solid motor tire department. When finished the new building can accommodate eight motor trucks. A truck can be run into the building in the evening after the truck has finished its day's work and new tires can be applied and ready for service the following morning.

PIERCE-ARROW'S NEW RIM—The Pierce-Arrow Motor Car Co., Buffalo, N. Y., has developed a modified Pierce-Arrow-Johnson demountable rim of the quick-detachable type. Besides being of 10 pounds lighter channel than the previous type, the removable flange ring is fitted with an original form of locking device. This consists of a removable key-piece having its ends shaped to dove-tail with the ends of the flange ring, drawing them together and downward into the slot which is rolled in the rim. While the factory is now well advanced in the production of parts for the new model pleasure cars, considerable effort is also being devoted to a new commercial model that is to make its appearance in due season.

CARRYING SERVICE IN FLORENCE—There are two motor-bus lines in Florence, Italy, both of which are operated during the day only. One of these lines operates three motor buses having a capacity of thirteen passengers each, and the full length of the line is about 1 mile. A 15-minute service is in operation, and the fare charged is 2 cents per passenger. The buses are supplied by the Fiat Co., 18 to 24 horsepower, and cost about $3,250 each. The drivers receive 80 cents and the conductors 60 cents per day. The other line, which is a suburban line, 6 miles long, runs six trips per day with one bus, which is a Fiat, with a seating capacity of fourteen passengers. The fares are as follows: To Trespiano, 4.3 miles, 30 cents; to Pratolina, 6.2 miles, 40 cents. The cost of the bus was about $4,000. The driver receives $1.20 and the conductor 68 cents per day.

MEXICO'S GOVERNMENT AUTOMOBILES.—Objection has been raised to the number of automobiles kept by the Mexican government for the use of its officials. Fifty-one cars are maintained at public expense at the government offices in the capital. The cars represent a total investment of $255,000. The annual maintenance charges are estimated at $232,642. This includes the salary of the chauffeur and generally a footman. Of this number twenty-two are Packards, sixteen are Protos, seven are Fiats, five are Cadillacs and one is a Buick. This is exclusive of the cars owned by the government and assigned to military work. A number of pleasure cars are used to patrol the roads of the Federal District, while most of the higher officers in the field are using motor cars. While many of the latter are rented, the government pays the charges as well as the cost of upkeep. Altogether the Mexican government's annual bill for automobile upkeep is well over half a million dollars.

Institution of Automobile Engineers, assembled before the office of the Ferro Mfg. Co., Cleveland, O.

MACDONALD RESIGNS FROM RUSSELL—K. B. MacDonald, who for the past 2 years has been factory manager of the Russell Motor Car Co., Ltd., at West Toronto, Ont., makers of Russell-Knight cars, has severed his connection with that company.

INVENTS NEW WHEEL MACHINE—Carl D. Fisher, Jr., of Wapakeneta, is the inventor of a machine which he claims will expediate the assembling of automobile wheels by means of large air pressure. The machine weighs 12,000 pounds and has been thoroughly tested, according to the inventor.

ELKHART WANTS APPARATUS BIDS.—The board of public works of Elkhart, Ind., will receive bids for motor apparatus to replace the three-horse truck now in use. It is estimated by the board that the installation of an automobile apparatus will be a saving of at least $2,500 a year to the city.

BUSINESS ENLARGED—The firm of Edwards and Dickey, proprietors of the big Rockingham garage on Vaughan street, Portsmouth, N. H., with C. E. Hoyt, have purchased the Beacham garage business in that city also, and the 5-year lease it had on its quarters, and will conduct both places under one management.

WHITE BRANCH MOVES—The branch of the White Automobile Co. at Providence, R. I., has been moved into a new home on Broad street near Beacon avenue, formerly the headquarters of the Oldsmobile, and which several other dealers were seeking. The old quarters on Cranston street will be used as a service station.

MILWAUKEE WANTS FIRE APPARATUS—The Milwaukee, Wis., common council committee on fire department has recommended the purchase of motor-propelled apparatus costing $41,000. The purchase will consist of three combination hose, chemical, ladder and passenger cars, one tractor for ladder truck or steam fire engine, and three light delivery cars for the supply and repair department. Thomas A. Clancy is chief.

Recent Incorporations in the Automobile Field

AUTOMOBILES AND PARTS

BAYPORT, N. Y.—W. L. Mantha Co.; capital, $1,000; to deal in automobiles. Incorporators: W. L. Mantha, N. F. Mantha.

BELLEFONTE, PA.—Bellefonte Automobile Mfg. Co.; to manufacture automobiles. Incorporators: F. Beakley, W. P. Sieg, E. A. Parrish.

BOSTON, MASS.—Britton-Stevens Motors Corp.; capital, $50,000; to deal in automobiles. Incorporators: W. H. Britton, G. D. Stevens.

CHICAGO, ILL.—Chicago Universal Motor Truck Co.; capital, $10,000; to deal in motor trucks. Incorporators: E. C. Rockwell, J. H. Dunn, C. M. Stevens.

CHICAGO, ILL.—Gloor Motor Truck Co.; capital, $25,000; to manufacture trucks. Incorporators: J. T. Devere, H. L. O'Meara, J. N. Chapman.

CHICAGO, ILL.—Krickwell Motor Co.; capital, $2,500; to deal in automobiles. Incorporators: C. W. Krick, William Capeslus, H. L. Strohm.

CINCINNATI, O.—G. A. Schacht Motor & Truck Co.; capital, $35,000; to manufacture and deal in automobiles. Incorporators: Gustac Schacht, William Schacht, Charles R. Talbott, T. C. Jung, M. L. Buchwalter.

CLEVELAND, O.—Auto Carriage Co.; capital, $10,000; to deal in automobiles. Incorporators: A. E. Bernsteen, E. B. Zwirk, Samuel Solker, M. L. Bernsteen, J. Nungesser.

HAVERHILL, MASS.—Mansur Motor Truck Co.; capital, $30,000; to deal in motor trucks. Incorporators: G. B. Mansur, K. L. Moses, N. L. Furbush.

INDIANAPOLIS, IND.—American Automobile Exchange; capital, $25,000; to deal in automobiles. Incorporators: Wilbur Wynant, W. R. Luke, E. C. Brennan.

LOS ANGELES, CAL.—Mehler Motor Car Sales Co.; capital, $5,000; to deal in automobiles. Incorporators: R. W. Mehler, J. J. Bacigalupi, P. Borden, D. L. Jones.

LOS ANGELES, CAL.—Mission Automobile and Realty Co.; capital, $10,000; to deal in automobiles. Incorporators: N. Ledgerwood, J. R. Matthews, I. S. Isenogle.

LOS ANGELES, CAL.—Pacific Auto Truck Mfg. Co.; capital, $250,000; to manufacture motor trucks. Incorporators: W. S. Wheaton, A. J. Pederson, D. M. Carroll, Ellis G. Brode, W. R. Swartwood.

MONTCLAIR, N. J.—Heyer Auto Supply Co.; capital, $25,000; to do a general automobile business. Incorporators: A. P. Heyer, J. Culvert.

NEW YORK CITY—Herlihy-Scales Co.; capital, $2,500; to deal in automobiles. Incorporators: Dalton Scales, Richard Herlihy, B. A. Judd.

NEW YORK CITY—Insular Service Corp.; capital, $50,000; to deal in automobiles and trucks. Incorporators: F. H. Cox, Theodore Kirby, A. E. Carpenter.

NEW YORK CITY—Lurie Auto Co.; capital, $1,000; to deal in automobiles. Incorporators: S. S. Rosenberg, I. R. Caplan, C. U. Backer.

PORT CHESTER, N. Y.—A. B. C. Automobile Co.; capital, $1,000; to deal in automobiles. Incorporators: W. D. Sporberg, W. F. Gainey, T. F. J. Connolly.

SALT LAKE CITY, UTAH—Deseret Motor Truck Co.; capital, $50,000; to manufacture and deal in motor trucks. Incorporators: Ira Cole, Domine Burns, J. E. Fleige.

SAN DIEGO, CAL.—Clark-Lilly Motor Car and Machine Co.; capital, $50,000; to deal in automobiles. Incorporators: C. C. Clark, J. T. Lilly, Morris Binnard.

GARAGES AND ACCESSORIES

BOSTON, MASS.—Oxford Garage Co.; capital, $10,000; to maintain an automobile garage. Incorporators: L. D. Robbins, E. L. Brown, S. B. Ingalls.

BROOKLYN, N. Y.—General Tourist Co.; capital, $25,000; to maintain an accessory store for tourists. Incorporators: S. E. Cooper, N. B. Mancill.

BROOKLYN, N. Y.—Brooklyn Auto Repair Co.; capital, $5,000; to deal in automobiles. Incorporators: L. N. Vause, H. P. Freece, C. V. Mulligan.

BUFFALO, N. Y.—Federal Sales Co.; capital, $10,000; to deal in automobile supplies. Incorporators: C. A. Hahl, J. J. Henry, H. S. Bliss.

CINCINNATI, O.—Motor Sales & Service Co.; capital, $5,000; to operate an automobile business and deal in parts and accessories. Incorporators: J. B. Minor, G. B. Jolly, Carl Lehmann, A. Majoewska, W. W. Helmholtz.

CLEVELAND, O.—Commercial Auto Body & Mfg. Co.; capital, $50,000; to manufacture automobile bodies. Incorporators: M. E. McManus, G. H. Krippenberg, F. L. Fuller, J. H. Orgill, J. E. Matthews.

CLEVELAND, O.—Kouyoumjian Electric & Mfg. Co.; capital, $100,000; to manufacture an electric generator for automobiles which will be a cooling fan and generator combined. Incorporators: Robert Williams, M. L. Long, E. K. Kouyoumjian, B. W. Brockett, C. H. Treach.

CLEVELAND, O.—Lake Shore Auto Cartage Co.; capital, $5,000; to do a general cartage and storage business. Incorporators: C. M. Handy, Charles Malouf, G. J. Klamm, John Nelisse, L. B. Handy.

ELKHART, IND.—Paxson Auto Livery; capital, $10,000; to conduct an automobile livery and baggage transfer business. Incorporators: C. E. Paxson, Samuel Gayman, Clyde Paxson.

FAIRBANKS, IND.—Pogue Garage Co.; capital, $30,000; garage business. Incorporators: James Bradbury, T. Johnson, H. Holmes.

INDIANAPOLIS, IND.—Electric Vehicle Co.; capital, $15,000; to operate a garage.

JACKSONVILLE, FLA.—Southern Tire & Supply Co.; capital, $12,000; to deal in accessories. Incorporators: Sam Dunlap, H. E. Perryman, C. E. Brown.

LOS ANGELES, CAL.—Long Beach Motor Supply Co.; capital, $10,000; to deal in accessories. Incorporators: R. F. Ingold, S. D. Weil, Edward Cooper.

MOBILE, ALA.—Hillman Taxi Service Co.; capital, $2,000; to maintain an automobile taxicab business. Incorporators: G. D. Hillman, M. F. Hillman, Rosina Hillman.

NEW YORK CITY—Alhambra Auto Painting and Trimming Co.; capital, $1,050; to paint automobiles. Incorporators: Adolph Horenstein, Max Marcus, Herman Marcus.

NEW YORK CITY—A. & N. Automobile Co.; capital, $1,000; to manufacture an automobile gas starter. Incorporators: E. C. Allison, H. B. Newins, I. M. Highbee.

NEW YORK CITY—Century Garage Corp.; capital, $1,000; to maintain an automobile garage. Incorporators: Moses Lampert, A. R. Martin, A. M. Martin.

NEW YORK CITY—Convent Garage Inc.; capital, $5,000; garage business. Incorporators: E. F. Dannemann, H. F. Dannemann, W. G. Dannemann.

NEW YORK CITY—Drenco Garage Inc.; capital, $10,000; to maintain an automobile garage. Incorporators: D. W. Driscoll, J. A. Rennie, C. Coon.

NORFOLK, VA.—Grent Garage Corp.; capital, $10,000; to maintain an automobile garage. Incorporators: W. H. Bell, A. B. Court, Julian Osborne.

PHILADELPHIA, PA.—Western Tire Co.; capital, $10,000; to deal in automobile tires.

MILWAUKEE, WIS.—Milwaukee Forge & Machine Co.; capital, $8,000; to repair automobiles. Incorporators: G. B. Pillar, A. W. Peffer, John Eckert, Charles Hartson.

SPRINGFIELD, ILL.—Springfield North End Auto Repairing and Vulcanizing Co.; capital, $2,500; to maintain an automobile garage. Incorporators: R. J. Marquardt, C. H. Hamann, Elizabeth Hamann.

TOLEDO, O.—Babcock Garage Co.; capital, $10,000; to maintain an automobile garage. Incorporators: Alonzo G. Duer, C. Wagenhausen, L. P. Wagenhausen.

CHANGES OF NAME AND CAPITAL

CHICAGO, ILL.—John Kelly & Sons; change of name to the Kelly Automobile Co.

CLEVELAND, O.—Bayne-Subers Tire & Rubber Co.; capital increased from $250,000 to $1,500,000.

CLEVELAND, O.—Bayne-Subers Tire & Rubber Co.; change of name to the Subers Fabric Co.

CLEVELAND, O.—Pharis Tire & Rubber Co.; capital increased to $50,000.

LOUDENVILLE, O.—Ohio Grease Lubricant Co.; change of name to the Ohio Grease Co.

ST. LOUIS, MO.—Brown Automobile Co.; change of name to the Peerless Motor Car Sales Co.

New Agencies Established During the Week

PASSENGER VEHICLES

Place	Car	Agent
Baltimore, Md.	Reo	W. A. Wehr
Columbus, O.	Crow	Clintonville Garage & Auto Co.
Columbus, O.	Crown	Clintonville Garage & Auto Co.
Fostoria, O.	Oakland	Nestlerods Bros.
Galveston, Tex.	Oldsmobile	Galveston Motor Car Co.
Hutchinson, Kan.	Rambler	Eaton Auto Co.
Lamartine, Wis.	Detroiter	S. E. McCumber & Son
Lamartine, Wis.	Marathon	S. E. McCumber & Son
Los Angeles, Cal.	Marion	Symonds Motor Car Co.
Los Angeles, Cal.	McFarlan	R. C. Merriam
Milwaukee, Wis.	Franklin	Sanger Automobile Co.
Milwaukee, Wis.	White	White Automobile Co.
Oakland, Cal.	Moline	C. C. Eichelberger
Pasadena, Cal.	Midland	Leonard Visner
Philadelphia, Pa.	Maxwell	Frank Fanning
Princeton, Ill.	Franklin	Evans-Coppins & Starks Co.
Racine, Wis.	Reo	Foster & Weichert
Salt Lake City, Utah	Speedwell	G. S. Holmes
San Diego, Cal.	Oakland	E. L. Peacock Auto Co.
Seattle, Wash.	American	Dr. M. A. Miller
Seattle, Wash.	Empire	C. R. Williams
Seattle, Wash.	Maxwell	Van Brunt Motor Car Co.
Seattle, Wash.	Oldsmobile	Washington Motor Car Co.
Vancouver, B. C.	Hudson	Dominion Motor Car Co.
Winnipeg, Can.	Chandler	Canadian Motor Car Co., Ltd.
Worcester, Mass.	Chandler	W. J. Woods
Youngstown, O.	Franklin	Jacob Struhldreher

COMMERCIAL VEHICLES

Place	Car	Agent
Baltimore, Md.	Lauth-Juergens	A. W. Fulton & Co.
Bakersfield, Cal.	Autocar	Short Bros.
Boston, Mass.	Dart	W. F. Magill
Export, Pa.	Vulcan	O. A. Grable
Hartford, Conn.	Blair	H. E. Putnam
Milwaukee, Wis.	White	Milwaukee Tire & Supply Co.
Minneapolis, Minn.	Dart	H. T. Heberle
Pittsburg, Pa.	Stewart	Alco Pittsburg Sales Co.
Salt Lake City, Utah	Speedwell	G. S. Holmes
Salt Lake City, Utah	Wagenhals	G. S. Holmes
San Diego, Cal.	Autocar	J. A. McCaddon
San Francisco, Cal.	Piggins	Interstate Motors Co.
Seattle, Wash.	Lincoln	Imperial Sales Co.
St. Louis, Mo.	Knox-Martin Tractor	Cabany Motor Car Co.
St. Louis, Mo.	Peerless	Peerless Motor Car Sales Co.
Tacoma, Wash.	Stewart	American Auto Co.

ELECTRIC VEHICLES

Place	Car	Agent
St. Louis, Mo.	Standard	T. J. Moss
Topeka, Kans.	Detroit	A. C. Roller

Trade Opportunities for American Cars

American Automobile Products Popular in Foreign Trade Centers—Dealers Anxious to Open Trade in Our Cars—Bus Lines Started

REPORTS from American consular officers show that the automobile and its accessories from this country are gradually getting a firm foothold in foreign lands. There is a call for electrics and motor trucks. The performance of the low-priced cars has been so good that there is quite a demand now by dealers in small cars who see a great future in the trade of such makes.

Electrical Supplies—In response to an inquiry from the United States, an American consul in the United Kingdom has forwarded catalogues and pamphlets showing the various styles of electrical supplies sold in his district. Several dealers in electrical specialties who were interviewed stated that the usual procedure is to purchase their stocks from large wholesale traders of representatives of manufacturers in London and other cities who call and solicit orders, but that practice would not deter them from purchasing direct from American manufacturers if the advantages could be shown to them. The names of three firms desirous of getting in touch with American manufacturers may be had on application to the Bureau of Foreign and Domestic Commerce. The complete report submitted by the consul, as well as the catalogues and other pamphlets forwarded, will be sent to interesed manufacturers. File No. 10989.

Motor Trucks—A motor traction company is being formed in a foreign city to handle and transport the cotton, coal, iron, machinery, and other heavy merchandise which forms an important part of the trade of the port, as it is thought the use of motor trucks will greatly expedite the supplies to the mills and the delivery of finished goods at the docks. It is proposed to commence with twenty-five motor trucks, ranging in carrying capacity from 3 to 10 tons. A number of the cars will be of automatic discharge and others will be equipped with self-contained winches for loading purposes. It is thought that most of the cars will be purchased in the United States. Further details will be given as soon as the company is organized, but in the meantime it might be well for American manufacturers of motor trucks to get in touch with the consul who furnished this information. File No. 10993.

Automobile Sundries—The Bureau of Foreign and Domestic Commerce is in receipt of a communication from an American firm manufacturing automobiles, stating that its German representative has made known his desire to get in touch with manufacturers of automobile sundries who may desire representation in Europe. The American firm writes that this representative has disposed of a number of cars for it. File No. 10775.

Automobiles and Motorcycles—A report from an American consular officer in Canada states that a local merchant of good standing is considering the purchase of an inexpensive runabout type of automobile or a first-class motorcycle. Interested American manufacturers may send their catalogues and price lists in duplicate to the consular officer in question, and one set will be handed to the intending purchaser, the other to be retained in his files for the information of any other inquirers. File No. 11131.

Automobile—An American consular officer in a European country reports that a resident of his district is in the market for an American automobile seating five persons, with a speed of 60 miles an hour, not less than 40 horsepower, of the latest design, with self-starter, electric lights, etc. Correspondence with the inquirer should be in German or French. File No. 11116. Address all communications to the Bureau of Foreign and Domestic Commerce, Washington, D. C.

Automobiles and Agricultural Machinery—An American consular officer in Western Europe reports that a business man in his district desires to enter into relations with American manufacturers of automobiles and agricultural machinery not already represented in that district. Correspondence should be in French. File No. 11107.

Electric Automobiles—An American consul in a European country reporting on the market for electric automobiles in his district states that two local business men, one of whom is agent for an American automobile, are interested in receiving offers and catalogues from American manufacturers of very cheap and light American electric cars which could be sold to the public at about $1,500. File No. 10762.

Automobiles—A report from an American consul in India states that a local motor-car company would like to obtain the agency of a light American automobile, four-seated, 4-cylinder, which completely equipped could be sold at retail for about $1,000. Catalogues, prices, and terms c.i.f. should be sent to the inquirer. File No. 11022.

Automobiles for War Use—The Ministry of War in a foreign country has appropriated $40,000 for the purchase of automobiles for the use of the local army. An American consul has forwarded the name of a business man from whom plans, prices, catalogues, etc., showing the class of machines manufactured for war purposes can be obtained. File No. 11014.

Automobile Chassis—A number of foreign dealers in motor cars, anticipating an increase in the customs tariff, desire to form prompt connections with manufacturers who are prepared to supply the chassis only. They propose to build the bodies and assemble the parts locally. Manufacturers of motor-car chassis, as well as of accessories, are requested to supply an American consular officer with about 1 dozen catalogues each, which will be turned over to the proper persons. In each case the prices f.o.b. New York, together with trade and cash discounts to dealers, and approximate weights and measurements, should accompany the catalogues. File No 10939.

Motor Buses—An American consul states that a syndicate has subscribed $125,000 and will purchase 200 motor buses this year and 350 during 1914. Some of the machines will be double deckers. File No. 11,085.

Automobile—A wealthy resident in a foreign country desires to receive catalogs and price lists of American automobiles. He has been favorably impressed with the performance of machinery and other articles of American manufacture, so there is no prejudice to overcome. File No. 11,086.

Automobile Tops—A carriage manufacturer in a city in Europe making a specialty of repairing automobiles has informed an American consulate that he desires to obtain American material used in covering automobile tops. He asks that American houses corresponding with him send samples and price lists. He is also interested in paints, oils and varnishes used in renovating automobiles. Correspondence in Russian, German or French is preferred. File No. 11,092.

SPRING Leaf Lubricator—In these days when the automobilist insists upon the utmost silence in the motor car which he drives, spring squeaks, no matter how small, are not to be tolerated. Besides, when the leaves of the springs become rusted and stick together, some of the car's resiliency is lost, because the springs become in effect the same as solid pieces of steel. But to eliminate these spring troubles in the usual way, driving a cold chisel between the leaves with a hammer, after the car has been jacked up to relieve the tension from the spring upon which the work is being performed, is no easy matter, and has the disadvantage of possible marring of the spring due to the application of the chisel and false hammer blows.

To eliminate these troubles and even the necessity for jacking up the car in order to spread the leaves to be oiled, the Spring Leaf Lubricator Co., Ann Arbor, Mich., has devised a special tool for spring doctoring. This devise consists of a simple, drop-forged clamp, Fig. 1, the jaws of which are provided with wedges for forcing in between the leaves. Fig 2 shows the method of application and one of the leaves spread for the insertion of oil.

The lubricator is made with sufficient width between its jaws for application to the widest passenger car springs now in use. For trucks, a heavier type is made which will accomodate the widest of commercial car springs. The only difference between the two types is that the latter is provided with a handle which is free to move in the hole in the end of the screw so as to afford the greater leverage necessary for spreading of the heavier truck springs.

Besides its usefulness as a leaf spreading device, the tool may be utilized as a repair clamp for clamping broken springs temporarily until they can be repaired. This application is shown in Fig. 3.

Hoffecker Electric Odometer—The Hoffecker Co., Boston, is making deliveries to builders of electric passenger cars of its electric odometer, Fig. 4, which resembles a speedometer, excepting in that it measures distances traveled, these being registered on a circular dial the same as speeds of travel are indicated on a speedometer. The dial reads to 100 miles, the reason being that the capacity of battery on one charge is generally lower than this. In the bottom of the dial space is a season odometer for 100,000 miles.

This instrument, being the first of its kind to be marketed, is a neat one, with a 3-inch dial, which is of black enamel with white letters and a white pointer or indicator hand. The bezel or casing for it is mounted on a small circular bracket screwed to the dash, the bezel threading into a socket in the center of the bracket. The casing is finished in black enamel and is 1.6875 inches thick.

The odometer mechanism is driven through a flexible shafting of standard Hoffecker construction and made up of seventeen strands of flexible piano wire. The gearing between the shaft and the road wheels is such that the shaft makes 180 revolutions per mile. As many electrics use solid rubber tires exclusively, the shafting has been mounted to not be influenced by the additional vibration.

The Hoffecker Co. is now marketing its combined speedometer-odometer and timepiece all mounted on a special oblong-shaped dash bracket 10.25 inches in length. All three of the instruments are made with a 3-inch dial, the small diameter of these being the reason for mounting the speedometer in one bezel without anything else, and the odometer with its trip and season recorders in a separate bezel. The trip odometer reading to 100 miles has the figures in a circle around the dial, with tenths and hundredths shown at each side the hand pivot and the 100,000-mile season odometer in the 6 o'clock position. Between the odometer and speedometer bezels are two buttons, the lower one a release and the top one a reset button for the odometer. The flexible shaft drive is connected horizontally at the right end from which point it is intended to be carried horizontally to the side of the body. The bezel of each instrument is finished in white nickel and carries a black porcelain dial with white enamel letters. The time piece is an 8-day Waltham movement.

Koenig's Portable Extension Battery Support—M. Koenig, chief engineer of the Central Brewing Co., New York City, has invented a most practical appliance for users of electric trucks. This device, Fig. 5, page 1286, is a portable extension battery support. It can be made to fit any truck or battery and is simple as well as effective. This support is put on in about a half a minute by simply placing two rods, extending from each end of the support, upon the channel frame, and then tightening a turnbuckle on each. There is a small extension on each end of the support, which is buckled to the battery cradle to keep the cradle from coming out when the battery is slid out for examination. The end of this extension is threaded so as to permit a variable adjustment. This battery support can be carried with the truck, which enables the driver to examine the battery with little effort.

Golden Glow Headlights—The Esterline Co., Indianapolis, Ind., is now marketing a new kind of headlight, being known as the Golden Glow, Fig. 6, on account of the peculiar light obtained with it. The latter is caused by the use of the special reflector, prepared as follows: The glass used for the reflector is shaped as a true parabola and ground to high brilliancy on both surfaces. After this has been done the surface is silvered with a relatively heavy plating and then covered with an electrolytic deposit of copper. The result is a red surface backed by silvery white, which practically equals the color of metallic gold. Due to this color, the reflector emanates a golden light instead of the whitish brilliancy produced by the incandescent bulb, and it is claimed that this light, while fully as penetrating as the white, lacks the painful quality of glaring white light. Incidentally, the claim is made by the manufacturer that the yellow light is

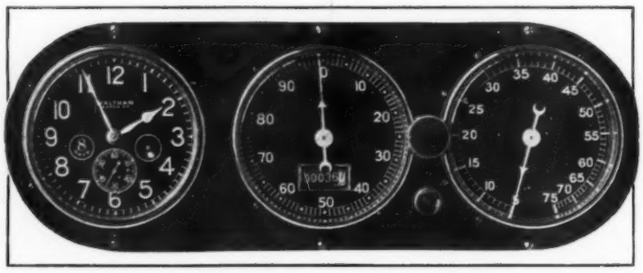


Fig. 4—The Hoffecker electric odometer

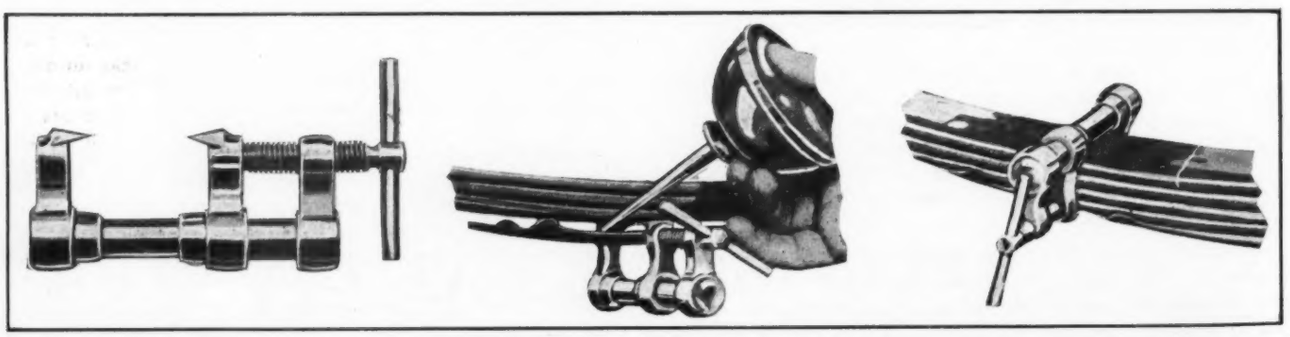


Fig. 1—Spring leaf lubricator

Fig. 2—Spreading leaves for application of oil

Fig. 3—As a repair clamp

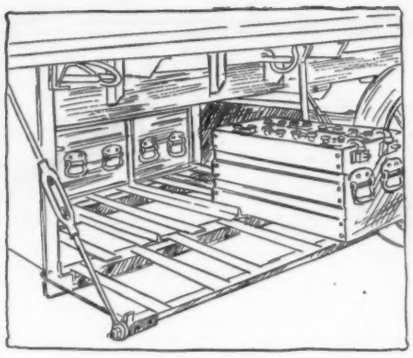


Fig. 5—Koenig's battery support

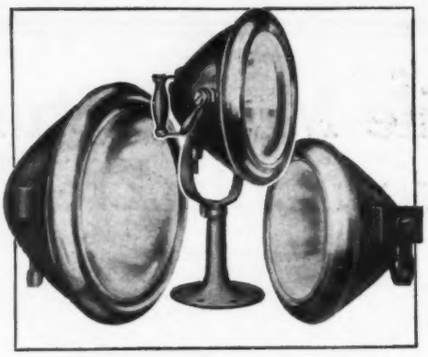


Fig. 6—Golden Glow lamps

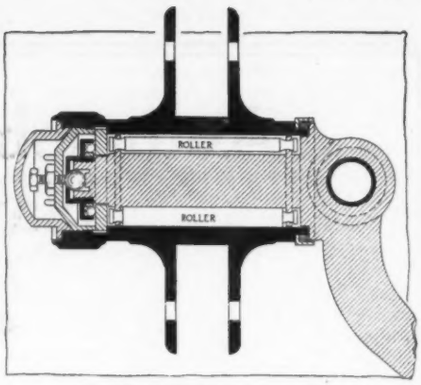


Fig. 7—American roller bearing

more powerful in passing through a foggy atmosphere than white light, and that therefore it is an advantage over the white light in every respect.

Golden glow reflectors are made in seven sizes, which range from 5 to 12 inches in diameter. They are placed in metal housings so shaped as to be in close contact with the metal at all times, being therefore well protected against breakage. The Esterline Co. makes four sizes of headlights, with diameter ranging from 9.25 to 12.5 inches. The front glass plates are held in place by several phosphor bronze springs, insuring their stability despite changes of atmospheric conditions and consequent expansion and contraction of the metal. In this way rattling and ultimate breakage are prevented.

The Golden Glow reflector is used not only in headlights, but also in a searchlight type of lamp. The latter is provided with trunnions and brackets for mounting in a suitable position on the car. The two sizes this light is made in are 11.25 and 15.5 inches diameter and 100-candlepower bulbs may be fitted to them.

Each Golden Glow lamp is fitted with a screw in the back so as to permit the ready adjustment of the focus. All that is necessary to throw the full beam of light at an object within a considerable distance is to turn the screw, without having to move the bulb. In the case of the searchlight, a thumbscrew takes the place of the plain screw, to permit of still more rapid focusing.

American Roller Bearing—One rarely hears of a bearing which is harmed by lubrication. Generally directions from the makers include a systematic sousing with oil at regular intervals. The American Roller Bearing Co., of Pittsburgh, Pa., has a bearing which it states should not be lubricated. It is composed of four parts: an inner casing, two sets of rollers, one set for spacing and the other for load carrying and the bond rings.

By the use of the spacing rollers there is no contact between weight-carrying members. The principle involved in this method of construction is responsible for the fact that the bearing will operate without lubricants.

The bearing is illustrated in Fig 7. As will be seen, the axle spindle carries the inner casing of the bearing and supports the load-carrying rollers. The inner casing also supports the spacing rollers and contains the track upon which these rollers revolve. When the bearing turns the load-carrying rollers revolve upon the inner casing and are separated from one another by the alternate rollers, which have no other duty than acting as separators. The spacing rollers are held in place by bond rings and being revolved by contact with the load-carrying rollers, turn in the opposite direction to these. The whole system of rollers thus turns together without rubbing friction due to revolving oppositely.

Turner Spring Controller—Yet another device designed to produce easy riding is shown in Fig. 8. It is claimed for this attachment that it does not affect the resiliency of the vehicle springs, as no friction is used while the spring is closing. At the left the device is shown assembled but without the lower ball-and-socket joint and the necessary clip to fasten the vertical rod to the car axle. The device itself as shown is bolted direct to the frame by a lug at each side of the outer casing.

The constituent parts are shown disassembled in the same illustration. A is the main casing. B, C, D and E are friction plates, two of which, having keys on their outer circumference remain stationary within the casing, while the other pair with keys only on the inner diameter are capable of rotation. All fractional faces are provided with oil grooves. F and F1 fit together and form an inclosed rachet which rotates as a whole inside the casing A when turned by the keyed drum G and the lever H, in a clockwise direction. In turning, this rachet carries with it, by means of teeth on the back of the part F the movable friction plates B and E, the plates C and D meanwhile remaining fixed, as does also the part J, which is keyed to the outer casing. The total amount of friction surface is 73 square inches. K is the outer cover of the device, and is provided with a gland hole which allows the casing to hold a full supply of lubricating oil and at the same time exclude dust and water. Constant contact of the frictional surfaces is maintained by means of the spring ring L, which is tightened up by screwing of the cover K.

In operation, when the arm H is pushed upward by the axle on impact with a road obstruction, the rachet is turned in a counter-clockwise direction, the pawls dropping into the rachet teeth successively, while all the friction plates, including B and E remain stationary. The pawls are so placed that the rachet clicks eighty times in a revolution. In the opposite direction, as before explained, the lever carries with it the plates B and E, causing the desired retardation of spring motion after passing over an equality in the road surface.

The designer and patentee of this spring controller is H. C. Turner of the Turner Oil Co., Los Angeles, Cal.

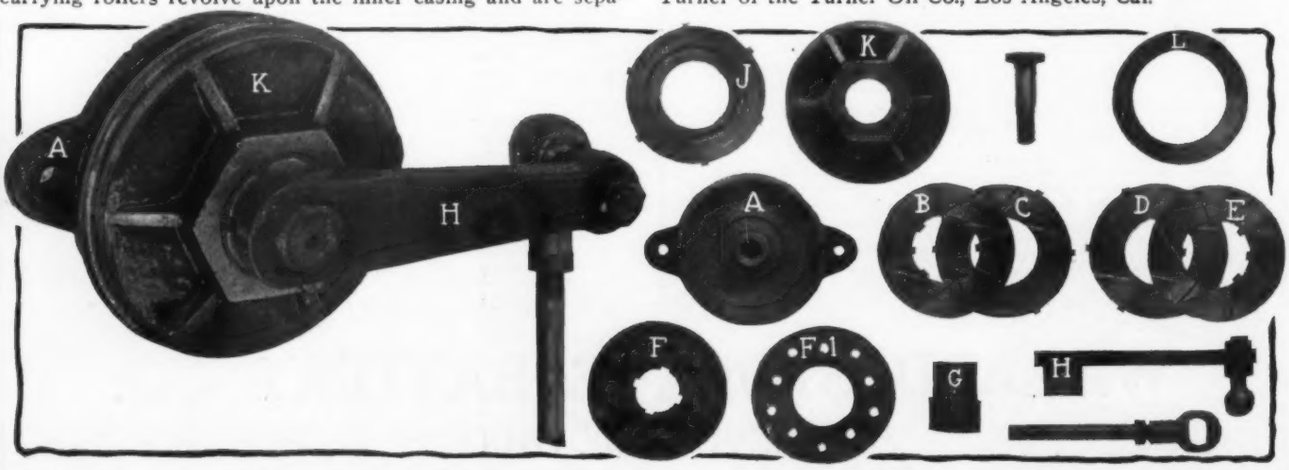


Fig. 8—Turner spring controller. At the left, the device is shown ready for mounting on the car. At the right are the constituent parts